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POPULAR COMPUTING

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OVATION

The Easiest-to-Use Integrated Software to Date!

HEWLETT-PACKARD'S REVOLUTIONARY PORTABLE

THE TRS-80 MODEL 2000

Tandy's new thrust into the MS-DOS market

An Action Game That Reaches New Heights: Dr. J and Larry Bird Go One-on-One

POPULAR COMPUTING ☐ JULY 1984 ☐ Vol. 3, No. 9

HOW TO PICK A PRINTER:

(A survivor's guide.)

WRITE DOWN WHAT YOU NEED ONE FOR IN THE FIRST PLACE.

And then the second place. And third place (Letters to customers, newsletters, financial reports, etc.). In other words, set down your priorities, in black and white—which will go a long way toward keeping you out of the red. Because the price of a printer is almost directly proportional first to the quality of its printing, and second to how fast it prints.

THERE ARE TWO KINDS OF PRINTERS IN THIS WORLD. CHOOSE ONE.

Either "letter-quality," which gives you text that you can't tell from hand-typed copy . . . or "dot-matrix," which, with a C. Itoh printer, looks like this. (Most other dot-matrix, or "business printers" have a far flimsier dot pattern, and give you copy that looks like a bad job of spray painting.) The former is for formal: reports to clients, final drafts of boilerplate, contracts, or letters to the President.

It prints with easily available "daisy wheels," similar to those on many typewriters. It's the "show" part of Show and Tell and its price reflects it.

Letter-quality printers generally cost about a grand more than their dot-matrix counterpart. Dot-matrix printers are made for the "tell" functions: things like financial data, interoffice memos, authors' first drafts, or "dumping" a bunch of programming data onto hard copy for reference or de-bugging.

Not fancy, but functional. And, comparatively, cheap.

FIGURE OUT HOW FAST YOU NEED WHAT.

Because the higher the speed, the higher the price—typically several hundred bucks per significant speed jump. (About speed: It's measured in "cps," or "characters per second.") A standard business letter contains about 1,000 characters. So, at 18 cps, it takes about a page per minute to print.

Therefore, you have to ask yourself if it's worth an extra $500 to double the speed with another letter-quality printer. If you churn out lots of copy, the answer is probably yes; if you grind out only a dozen letters a day, it's probably no.

UNDERSTAND THIS: WITH ANY BRAND OF PRINTER, YOU GET WHAT YOU PAY FOR.

If you buy a Brand-X printer for $1,000, it's going to be better or faster or somehow gooder than the same brand that costs $500.

In the case of the C. Itoh line of printers, the same holds true. Even though we promise that at every price point you're getting the very highest value for the very lowest buck. By a long shot.

And that's a gross understatement.

BEWARE THE BRAND, THE WARRANTY, AND THE SERVICE.

No printer is perfect. (At least not forever.)

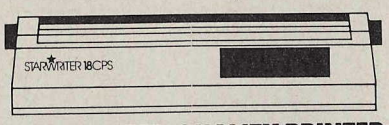
Which is why most other brands come with a 90-day warranty, a service policy that requires a lawyer, and a repair department in Des Moines or someplace.

Nor do we claim perfection. But every C. Itoh printer is backed by a full-year warranty.

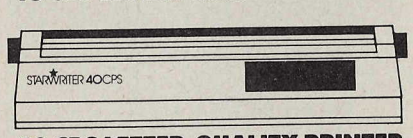
Check the chart (opposite). And if you still have questions, we still have people with answers. Call toll-free.

WHICH PRINTER TO PICK:

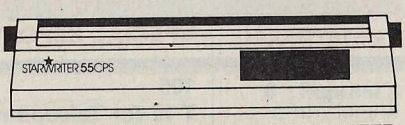
(A survivor's friend.)



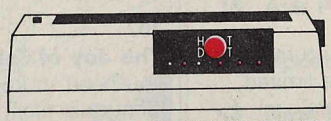
18 CPS LETTER-QUALITY PRINTER



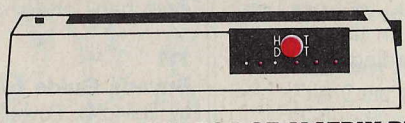
40 CPS LETTER-QUALITY PRINTER



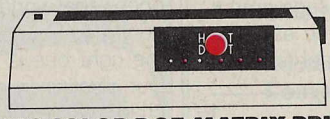
55 CPS LETTER-QUALITY PRINTER



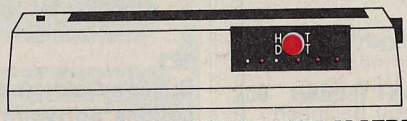
180 CPS DOT-MATRIX PRINTER



WIDE-CARRIAGE 180 CPS DOT-MATRIX PRINTER



180 CPS COLOR DOT-MATRIX PRINTER



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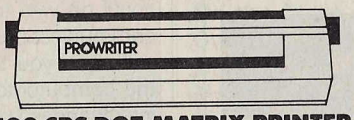
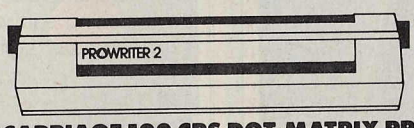


120 CPS DOT-MATRIX PRINTER



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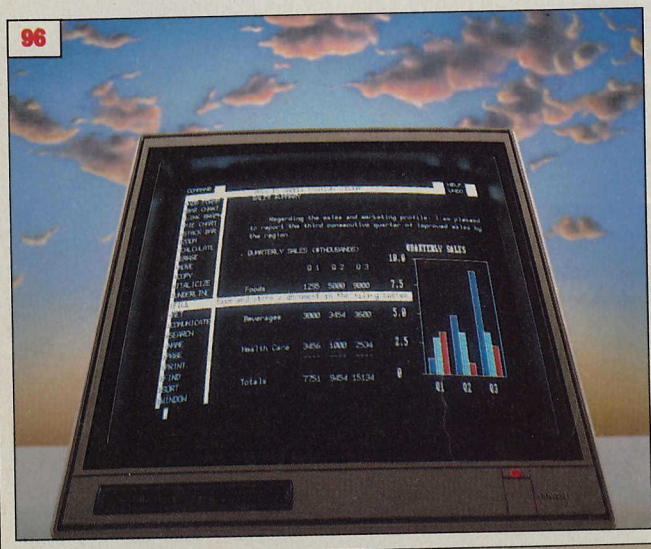

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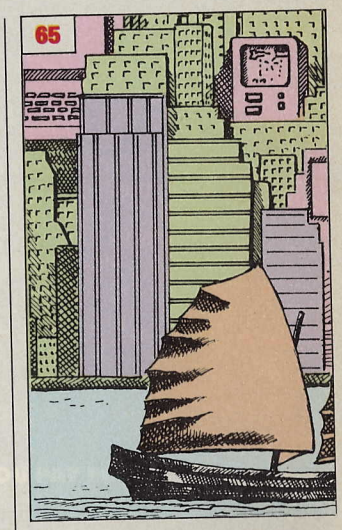

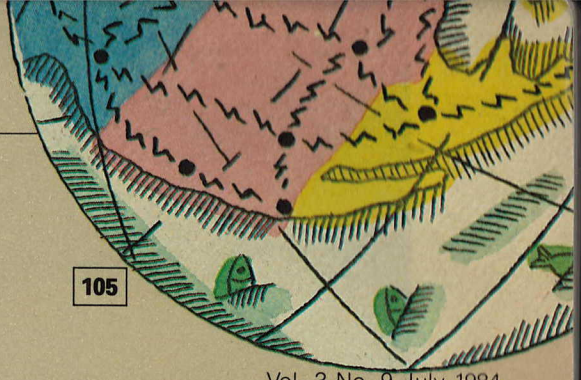

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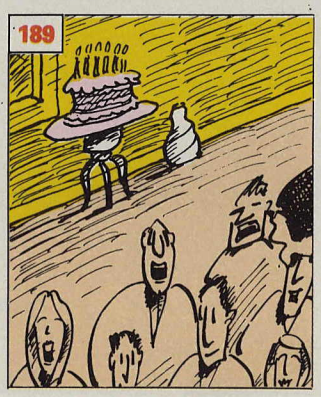

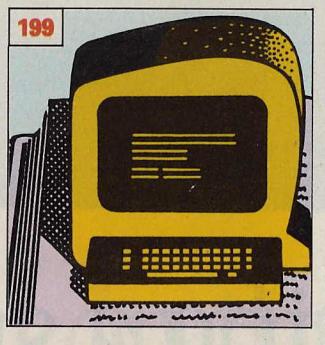

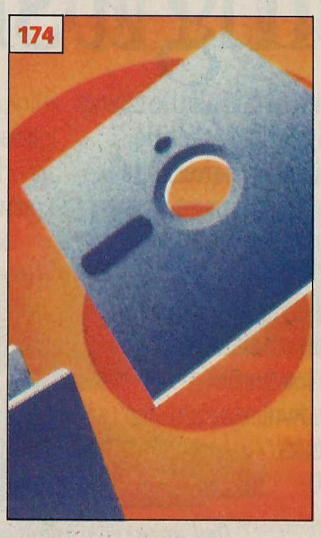

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Announcing a small imp

It's 12″ x 11¼″ x 2¼″.
It weighs less than 8 pounds.*
And costs less than $1,300.**
Yet with 128K, the new Apple® IIc Personal Computer is a lot bigger than it looks.

The IIc has a full-size keyboard.

Because it's inherited all the talents of the eminently talented Apple IIe:

The versatility to run over 10,000 different software programs.

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A built-in half-high 143K single-sided disk drive.

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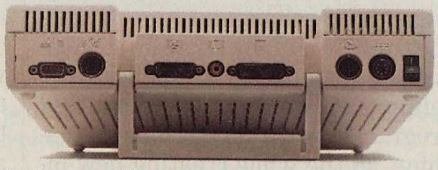
rovement on the Apple IIe.

Including the new Apple Scribe—Apple's first full-color print-on-anything printer for under $300, it can handle anything from business graphics to term papers.

The IIc's father, of course, is the granddaddy of the whole personal computer industry, the Apple IIe. Which, lest we forget, has quite a few improvements of its own this year.

The IIe can now use our ProFile™ hard disk—so it can store about 2400 pages of anything you'd like to remember.

And the Apple IIe is still the most expandable personal computer there is.



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** Don't asterisks make you suspicious as all get-out? Well, all this one means is that the IIc CPU alone weighs 7.5 pounds. The power pack, monitor, an extra disk drive, a printer and several bricks will make the IIc weigh more. Our lawyers were concerned that you might not be able to figure this one out for yourself. ** The FTC is concerned about price-fixing. So this is only a Suggested Retail Price. You can pay more if you really want to. Or less.* *© 1984 Apple Computer, Inc. Apple, the Apple logo and ProFile are trademarks of Apple Computer, Inc. CP/M is a trademark of Digital Research Inc.*

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Running in Place

Alice met the Red Queen in the garden. The Queen urged "Faster! faster!" but "however fast they went they never seemed to pass anything." Finally Alice commented, "Well, in our country,. . .you'd generally get to somewhere else—if you ran very fast for a long time as we've been doing."

"A slow sort of country!" said the Queen. "Now, here, you see, it takes all the running you can do to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that." (*Through the Looking-Glass*, Lewis Carroll)

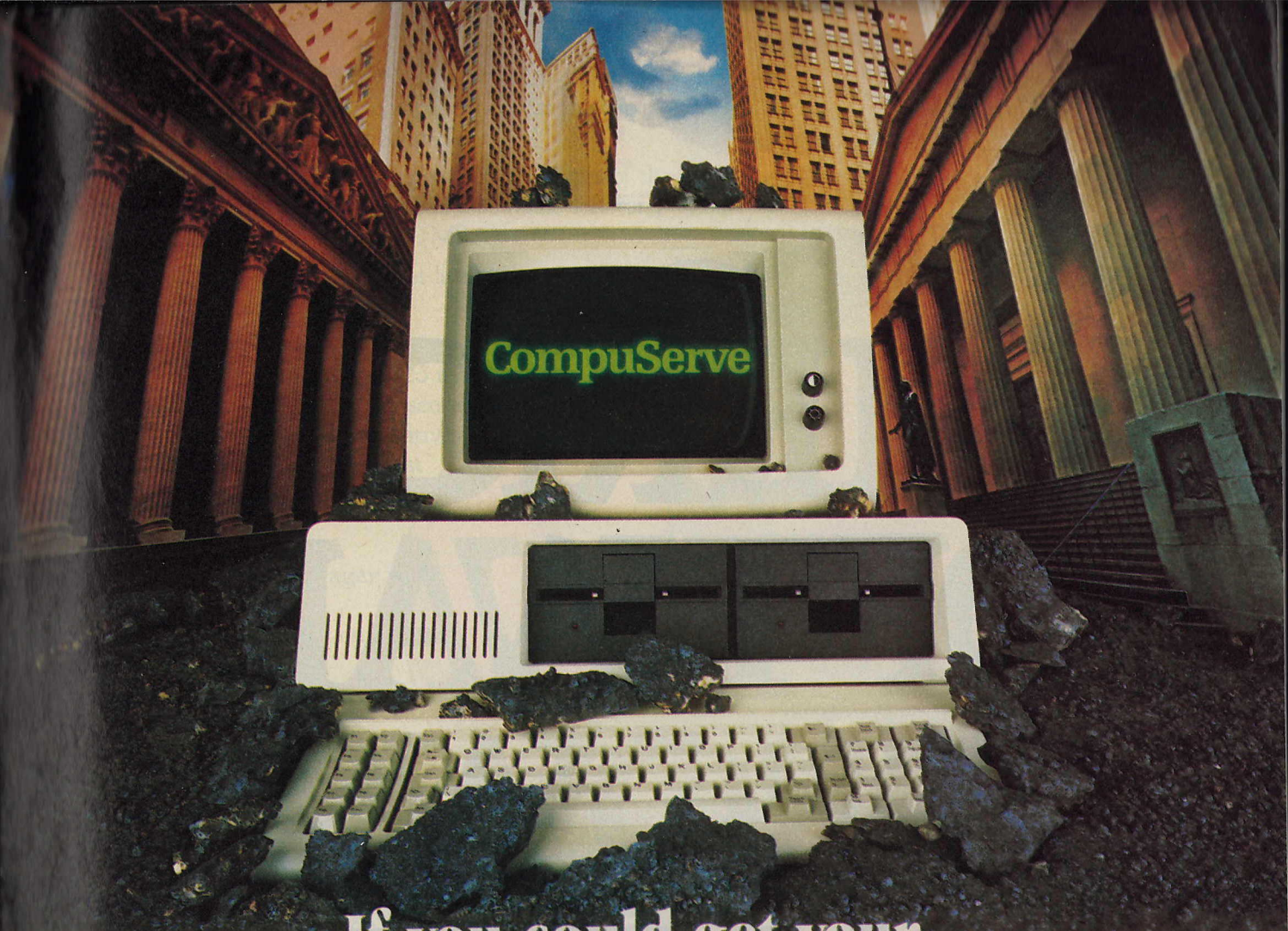
Pausing in our frenetic exploration of the microcomputer world reveals that our recipe for simply keeping up grows more complex every day—to get somewhere else seems impossible. Just to keep pace we must look at almost 2000 press releases every month extolling the virtues of programs, machines, or companies. We add a daily schedule of press conferences and tours, hundreds of phone calls, a multitude of computer shows happening all over the world, and over 200 publications devoted to some aspect of microcomputing. Then we mix all of this thoroughly with exploring the microcomputer and its software.

Microcomputer users continually seek answers by discovering exactly what the machine and its software does, test what they know by stretching the boundaries of applications, refine their opinions by comparing program to program, machine to machine, all the while creating new information through discovery of additional features and capabilities. The clamor of our answers collides with the cry of our questions. As we grasp one concept, it is replaced by a new advance; when we master a program, a new version appears. Microcomputers solve problems and in doing so create new problems to be solved.

So we run, speeding onward. Faster and faster we pursue a horizon that remains elusive. And every day, more microcomputer users become runners, joining our race for information, participating in an event more collaborative than competitive, more like a relay than a sprint. Each of us pauses, passes the baton, believing we have gone as fast and far as we can, accomplished as much as is humanly possible. Only we don't stop. We just get our bearings and push off once more, surprised by the intensity of our collective drive for information.

Our compulsion for discovery and answers about microcomputers rivals the drive that propelled our ancestors westward across the country. We occasionally pause as they did, to marvel at the latest wonder, but then we too push on—not knowing what is ahead, driven by a quest to discover and understand. The unknown promise of the microcomputer, like the enigma of what existed beyond the Appalachians, transforms a deluge of information into an unending stimulus. And like the westward ventures and expansion, our microcomputer exploration and mapping endeavors deliver a continuously evolving concept of our world. We are running as fast as we can and just keeping up, staying in the same relative place. But as long as our present remains as stimulating as our future *used* to be, we don't need to get anywhere else.

Pamela Clark
Editor in Chief



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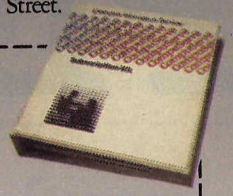

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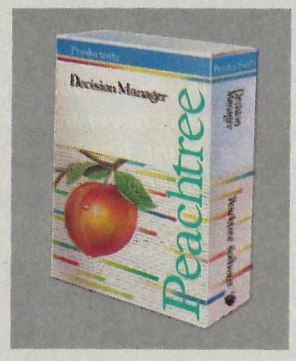

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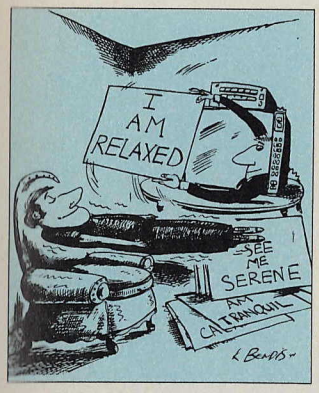

Personal Power

Dear Editor:

Both the promise and the perversion of the computer revolution were pointed out in the columns by Steven Levy and Jerry Pournelle in the April issue of your excellent magazine. (See Micro Journal, page 70, and The Micro Revolution, page 81.) I share with these writers a fervor for what is undoubtedly a real social, personal, and, ultimately, political revolution being brought on by the microcomputer.

The personal computer can be viewed as a device that has the potential to help us recover some of the power and independence that we as individuals have lost since the advent of the industrial age. The forces that have been acting to automate the human personality and subjugate the individual through increased specialization of function are now being offset by the ultimate automated machine, the computer.

Rather than restrict and confine, personal computers can help us release innate abilities that have atrophied over the past centuries. Relieved from the burden of using our brains as storage bins and our bodies as instruments of servitude, the creative, intuitive, and perhaps even psychic boundaries of our minds can be explored and expanded.

But just as there is a flip side to every coin, so there are dangers of excess and corruption in any revolution. We must be the masters of technology, not be mastered by it. As the power available to individuals increases so does their responsibility to keep informed and vigilant. Misuse and abuse of advanced technology by a central authority, an institution, a corporation, or even a single misguided, irresponsible person must be guarded against.

Paul DiBara
Barre, MA

Dear Editor:

Jerry Pournelle's article "The Mighty Micro" in the April issue (page 81) was very welcome, interesting, and starts to fill in a knowledge gap that I, and I expect many others, have worried about. Please continue the series.

For several years, I have played with my TRS-80 Model III but felt somewhat that I have a black box. At the local college, I've taken courses in BASIC, FORTRAN, Pascal, and assembly language, but an awful lot has been missing.

My computer is strictly for fun as I am retired. I enjoy writing my own do-nothing programs—my versions for handling an auction, for designing active and passive solar heating systems, etc.—but I *want* to know more—to understand how these microcomputers are doing their stuff.

Ed Rehnborg
North Bend, OR

Subliminal Software

Dear Editor:

I would like to commend Steven Levy for the very relevant questions he raises in "The Selling of the Subliminal" in your April issue (page 70). A great many individuals are plagued by uncomfortable feelings and behavior patterns that they would like to alter in the easiest way. In over 25 years as a practicing clinical psychologist I have, more than once, encountered people who would welcome the diagnosis of a brain tumor to account for some undesirable trait rather than deal with the complexities of their feelings. A diagnosis of this type would enable someone else to "cure them" and relieve them of the responsibility. Subliminal influence is similar in its guise as an easy and emotionally painless solution.

However, the undesirable traits or feelings we encounter are not random and have not inhabited the individual by chance. We are integrated organisms, and these patterns, as others, serve some function. Smoking, eating, anxiety, etc., all have associative experiences. The behavior is connected to some meaningful experience. Any attempt to eliminate symptomatic behavior does not deal with the underlying factors. It is therefore possible for a more serious reaction to occur. An extreme example would be eliminating the awareness of pain, via posthypnotic suggestion, to relieve someone's headache. Because the awareness of pain is vital to our existence, this would be disastrous.

It is, as Levy implies, quite alarming when the opportunity for financial gain tends to set aside the very cautious investigative measures that are vital before tampering with behavioral change in this uncontrolled manner. It is comparable to a physician giving a prescription over the phone without ever having seen the patient. I sincerely hope most people will recognize the dangers inherent in this approach and not purchase this type of "solution."

Samuel J. Neiditch
San Bernardino, CA

Dear Editor:

I just finished reading "The Selling of the Subliminal" in your April issue. I found Steven Levy's smug writing style and constant reference to one of the people who consented to be interviewed to be the lowest possible type of cheap-shot journalism. By choosing to constantly refer to Dr. LeBenne as "Dr. Wallace D. LeBenne, PhD," Levy was making an obvious and very crude attempt to degrade the man and the company he represents. It is a matter of historical record that such clumsy propaganda techniques are used by political parties and other groups to promote their own point of view. By doing so Levy made a fumbling attempt to emulate the very technique used by Stimutech, whose products he unmistakably has very strong negative opinions about.

While I enjoy reading *Popular Computing*, I do not appreciate being subjected to this type of editorializing in an article that is supposed to be relating facts about a product. It is very annoying and I would expect to find your technique in the magazines I read while waiting in line at the supermarket.

Charles O. Slavens
New York, NY

Monitor Article Update

Dear Editor:

I read the article on monitors in the February issue (page 122) with a sense of dismay, unsure whether the author had deliberately oversimplified or really did

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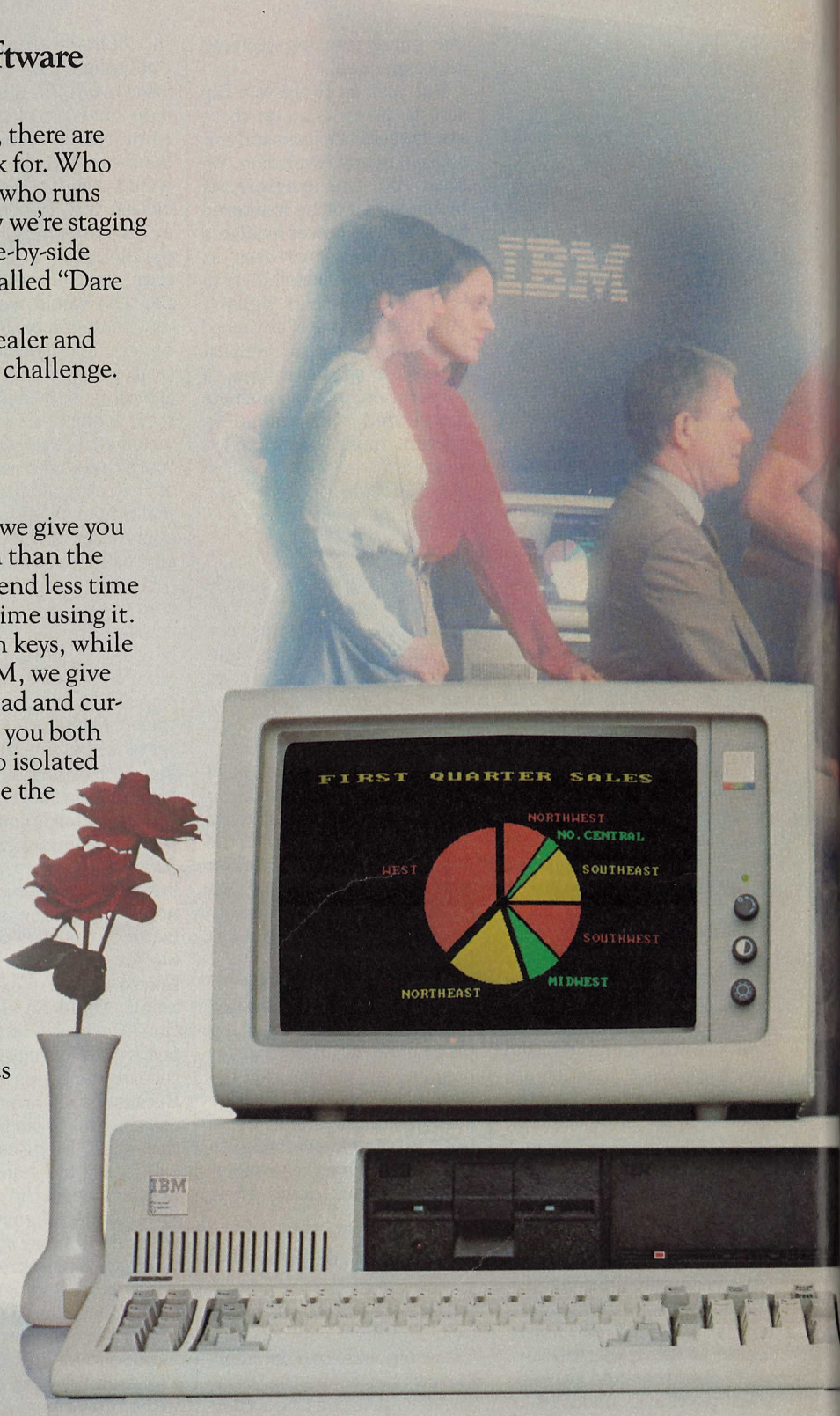

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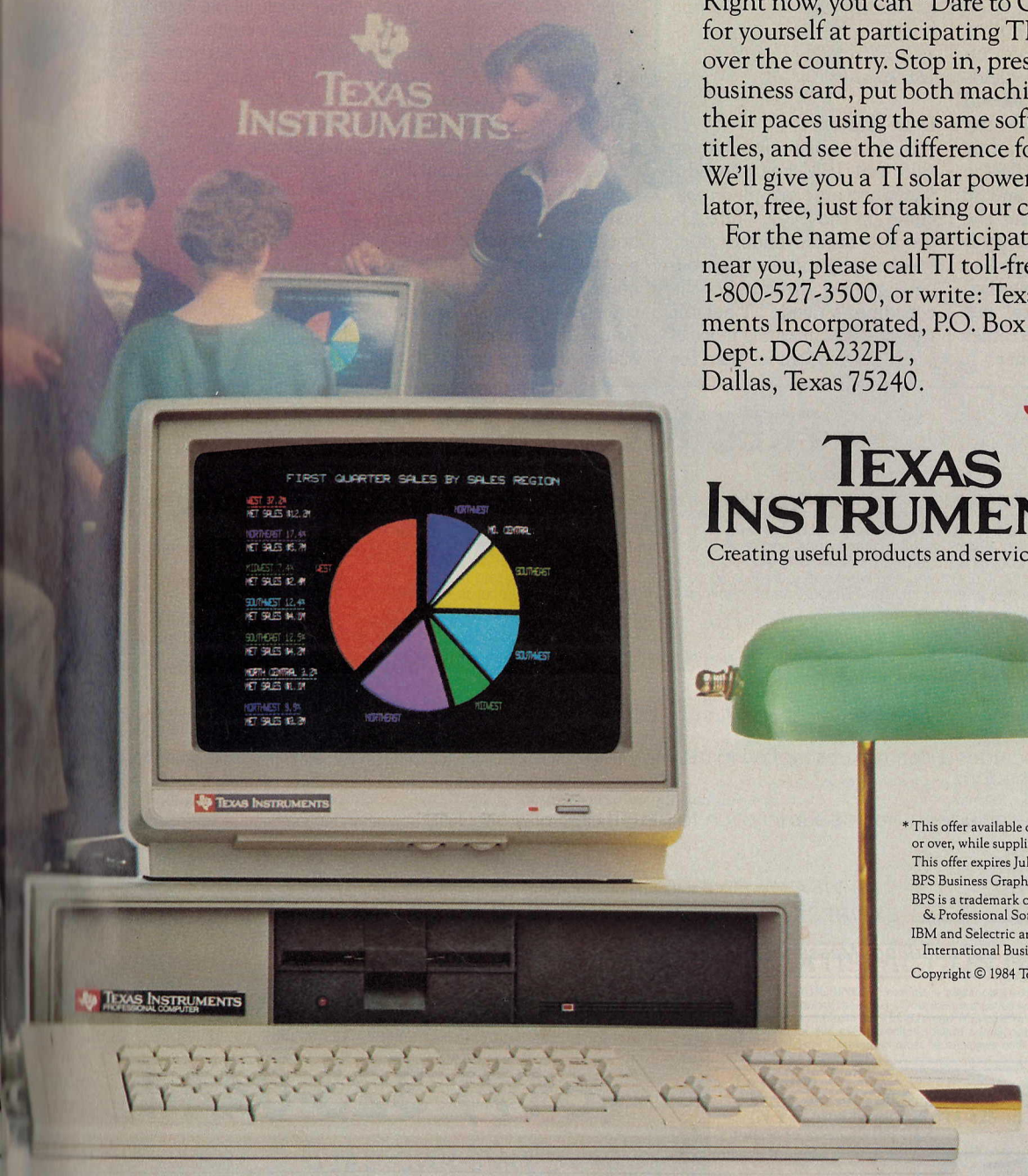

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LETTERS

not understand CRTs and their circuits.

Deflection yokes are not part of the tube itself, nor are they *inside* the tube, as the drawings indicate, but they are sets of coils mounted *outside* around the neck and snugged up to the bell of the tube.

The raster scan shown appears to be deliberately oversimplified. In fact, normal scanning is at the rate of 30 frames per second, but it takes two fields to make up each frame, and the two fields are interlaced: the second scan is traced *between* the lines of the first scan; this interlacing is to reduce flicker. So there are 60 fields and 30 frames per second, and the vertical scanning frequency is 60 Hz. Computer people like to invent new jargon, so they call this a "refresh rate," but in the industry—electronics and TV—from whence it came, it is referred to simply as the *scanning frequency*.

Herman Holtz
Silver Spring, MD

IBM: Pros and Cons

Dear Editor:

Thanks for your April editorial, "The Responsibility of Leadership." Objective reporting is appreciated, and certainly the consumer has a right to know that IBM is not as cuddly as the Chaplin image.

Bill Fitzgibbon
Harrisonburg, VA

Dear Editor:

In your April editorial you said that IBM has offered a "deliberately crippled machine" in the PCjr, while Apple and other vendors offer "technically innovative products geared directly to the consumer's needs." I submit that the Macintosh is more of a "crippled machine" than the PCjr because the user isn't even allowed to remove its cover! At least the PCjr is wide open to whatever add-ons IBM or other vendors may eventually dream up to plug into it.

David McManigal
Stormville, NY

Agrees with Review

Dear Editor:

As unfortunate owner of Continental Software Company's Home Accountant Plus, I can confirm that Karl Keller's criticisms of the package are quite accurate ("Making Sense in Home Accounting," April, page 166). I only wish he had reviewed it sooner and saved me the money.

The Home Accountant Plus is slow, confusing, and awkward to use. Its structure bears no relation to the simple accounting one uses at home, and the manual that comes with it is terrible. Worse, the company demands $20 in advance before it will answer any questions or—get this—even correct any bugs. The company calls it an "extended warranty." I call it a rip-off.

There must be a lot of other readers who wish Keller's review had come sooner. I say this because The Home Accountant Plus appeared near the top of *INC.* magazine's best-selling software list. I agree that the program belongs on a list, but not of best-sellers.

By the way, thanks for doing your job so well by putting out a computer magazine that consistently manages to stay a healthy cut above all the others.

Gil Bassak
Scarsdale, NY

Popular Computing welcomes your feedback regarding articles that appear in this magazine as well as your comments about the personal computing field in general. Write to Letters, *Popular Computing,* POB 397, Hancock, NH 03449. (Due to the number of letters received, we cannot respond individually.)

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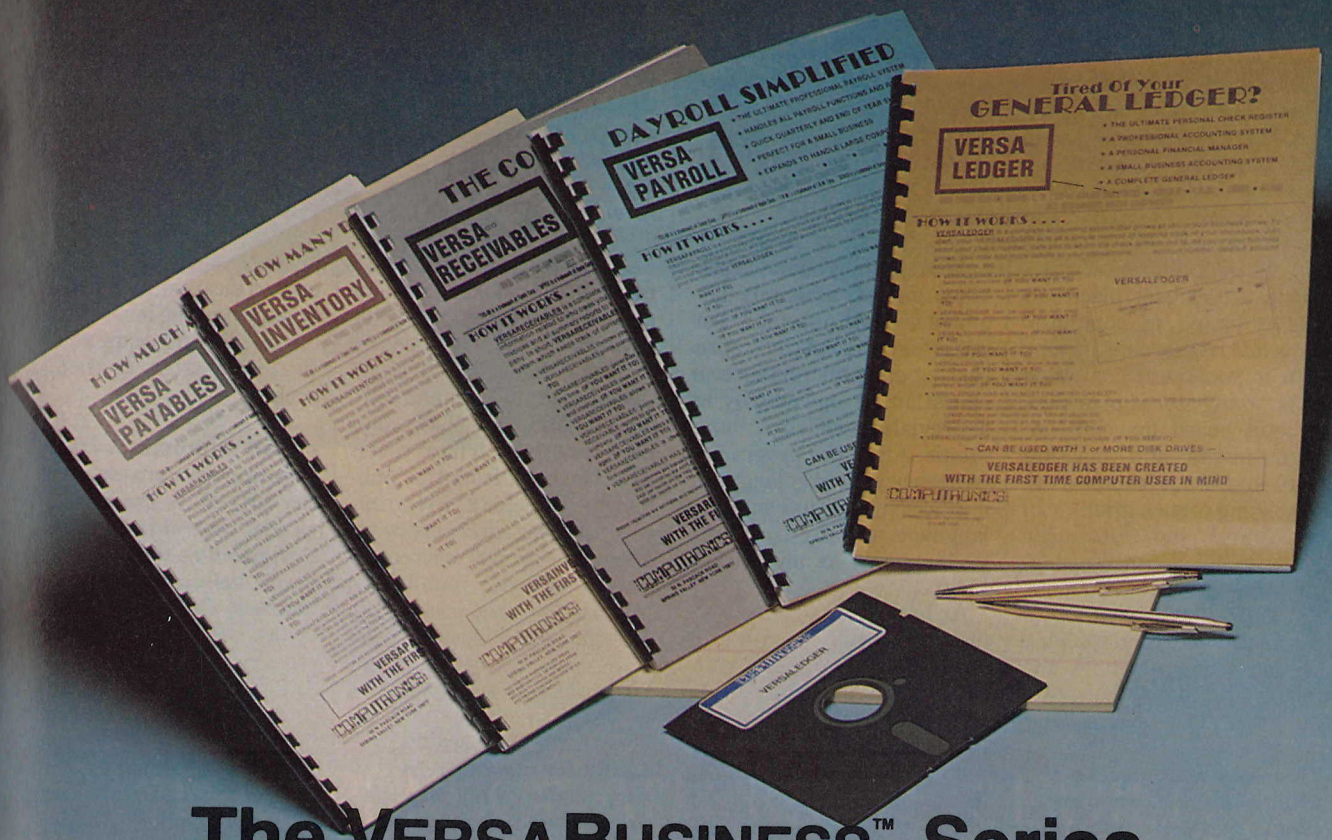

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I've seen ads for clubs for Apple II and IBM PC users, but I have not seen any for Radio Shack TRS-80 Model III users. How can I find such clubs in my area?
Daniel Rosen
Mt. Vernon, NY

One of the best places to find a listing of computer clubs and user groups in your area is your local computer store. Many stores provide a bulletin board for club announcements and meeting notices. Also, a comprehensive listing of such groups can be found in *Computer Shopper* (407 South Washington Ave., POB F, Titusville, FL 32781, (305) 269-3211), a national publication for buying and selling computers and related products. Subscriptions are $15 a year.

I recently purchased a TRS-80 Color Computer 2. Where can I obtain an income tax program for a small business?
Howard H. Halperin
Phoenix, AZ

While the TRS-80 Color Computer 2 is not generally considered a business computer, many such programs have been written for it. Here are just a couple:

Tax Command from Practical Programs (POB 93104-U, Milwaukee, WI 53203, (414) 278-0829) is a low-cost ($24.95) package for line-by-line preparation of income taxes and includes built-in 1040 tax tables.

CoCo Tax Preparer, a disk-based program from Micro Data Systems (6 Edwards Dr., Ashland, MA 01721, (617) 881-4995), is a professional tax program that requires at least one disk drive. It features over 170 full-screen menus, built-in tables, and supports many of the IRS forms. It sells for $149.95.

Is there a programming language available for the Atari 800XL that is fast enough for writing video games?
Josh Carpenter
Swanzey, NH

Yes. For the rapid graphic motion that is required in video games, assembly language is best. Assembly language is a means of representing each microprocessor operation, or op-code, by an abbreviation called a *mnemonic*. After the program is written in assembly language, it is "assembled" into machine language, usually by a program known as an "assembler."

An excellent book on creating your own video games is *Atari Graphics and Arcade Game Design* by Jeffrey Stanton with Dan Pinal (published by The Book Company, 11223 South Hindry Ave., Los Angeles, CA 90045 (800) 556-1234, ext. 518). This $14.95 book covers game concepts through player-missile and character-set animation techniques in machine language, and BASIC-language programming with machine-language subroutines and custom display lists, color, and sound.

You might also consider a program that lets you create graphics animation from BASIC. One such program, pm Animator, $44.95 from Don't Ask Computer Software (2265 Westwood Blvd., Suite B-150, Los Angeles, CA 90064 (213) 215-0529), lets you draw pictures, edit, and animate them. All of the colors, motions, and shapes from player-missile graphics can be achieved from a BASIC program.

In a past "Ask Popular" column, you mentioned *The 1984 Writer's Market*, a reference book published by Writer's Digest Books, but didn't give their address. Would you please supply us with this information?
Seth Levin
New York, NY

The 1984 Writer's Market is a reference work that lists most of the book publishers actively seeking program listings. It is published by Writer's Digest Books (9933 Alliance Rd., Cincinnati, OH 45242, (800) 543-4644), and sells for $18.95 in hard cover. Another book from this publisher, *The 1984 Programmer's Market*, gives inside information on 500 microcomputer software publishers that use freelance material. It sells for $16.95. Both these books are available from bookstores or the publisher.

Your June 1983 article on computer careers was very useful in helping me decide which college to attend. However, when I tried to find a course in electronic engineering, all I found was either electrical engineering or electronic engineering technology, or both. I'm confused; can you help?
Ben Fischer
Delphos, OH

Electronic engineering is a branch of electrical engineering. Most four-year electrical engineering programs consist of a core group of required subjects and various electives. The required subjects usually include mathematics, physics, chemistry, English, history, sociology, and economics, plus introductory courses in the student's major. In the junior and senior years, along with the advanced required courses in the major, students take elective courses in particular areas of specialization. It is here that the courses in electronics are taken.

The degree earned is a bachelor of science in electrical engineering. The specialty can be any area of interest within that degree.

Some colleges offer a two-year electronic engineering technology program that leads to an associate degree or certification as electronic technician. The level of training is not as rigorous, and the subject matter is not as broad.

I need information on the Promqueen cartridge for the VIC-20. Is there a similar cartridge for the Commodore 64?
Frank Valenzuela
Ventura, CA

The Promqueen is an accessory device for programming EPROMS—erasable programmable read-only memory chips—on a Commodore VIC-20 computer. It consists of a cartridge that plugs into the memory-expansion port of the VIC, firmware (software on a separate EPROM), and a 25-page manual. It has a zero-insertion-force socket to permit easy plug-in of the popular 2K- and 4K-byte EPROMs to be read, edited, and programmed.

EPROMs are generally used for storing machine-language programs such as games, utility routines, and control applications. The program is first written and loaded into the computer's memory. After it has been tested and debugged, it is permanently stored in the EPROM until erased by a special ultraviolet light.

Ask Popular is a monthly column conducted by contributing editors Harv Weiner and Steve Ciarcia to answer general questions about small computers. Send your questions to Ask Popular, POB 397, Hancock, NH 03449.

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A similar unit, the PQ/64, is available for the Commodore 64 computer. It has all the features of the Promqueen, but the software is enhanced to include serial communications and printouts.

Both units are available from Gloucester Computer, 1 Blackburn Center, Gloucester, MA 01930 (617) 283-7719. The Promqueen sells for $149, and PQ/64 for $199.

Can a computer bought in the Unites States work in Europe without problems, provided that one uses an appropriate voltage adapter?
P. Alevantis
Amarousio, Greece

Yes, in some cases. The problem lies in the different *line frequencies*. The standard line voltage in the U.S. is 120 volts, 60 hertz (cycles per second) AC, and most computers made in this country conform to this standard. The line voltage in most European countries is 220 volts, 50 hertz AC. As you have already discovered, adapters are available that can convert the 220 volts to 120 volts.

Converting the line frequency, however, is much more difficult and usually requires some electronic switching circuitry. Moreover, a power transformer requires a larger iron core for 50-Hz operation, and operating a 60-Hz transformer at 50 Hz will generate more heat in the transformer core and could pose a fire hazard. However, changing the line frequency is not necessary if the computer's power supply is rated for a range of 50 to 60 Hz. Some computer power supplies that use a "switching" technique are more tolerant of line frequency changes.

To be sure, you should check the voltage and frequency ratings on your computer; this information appears on a nameplate near the power cord or on the transformer housing.

I need a low-cost hardware and software system that will enable me to track the performance of stocks on the New York, American, and over-the-counter exchanges. I'm looking for an unsophisticated system that would enable me to "get my feet wet."
P. Grimaud
Issaquah, WA

The best way to put together a computer system is to first decide what software is required and then choose the components to run that software. Because there are many ways to track stocks, *you* must identify the software that meets your requirements.

Here are a few popular programs for tracking stocks and market evaluation:

Dow Jones Market Analyzer ($349), Dow Jones Market Manager ($299), and Dow Jones Market Microscope ($699) from Dow Jones & Company, Inc., POB 300, Princeton, NJ 08540. For Apple computers and the IBM Personal Computer.

The Fundamental Investor ($495), and The Technical Investor ($395) from Savant Corporation, POB 440278, Houston, TX 77244, (800) 231-9900; in Texas, (713) 556-8363. For the IBM Personal Computer.

Market Analyzer ($395), Market Illustrator ($195), Stock Analyzer ($295), and Stock Illustrator ($125) from N-Squared Computing, 5318 Forest Ridge Rd., Silverton, OR 97381, (503) 873-5906. For Apple computers and the IBM Personal Computer.

Market Counselor from Capital Management Systems, 3800 West 17th Ave., Denver, CO 80204, (303)

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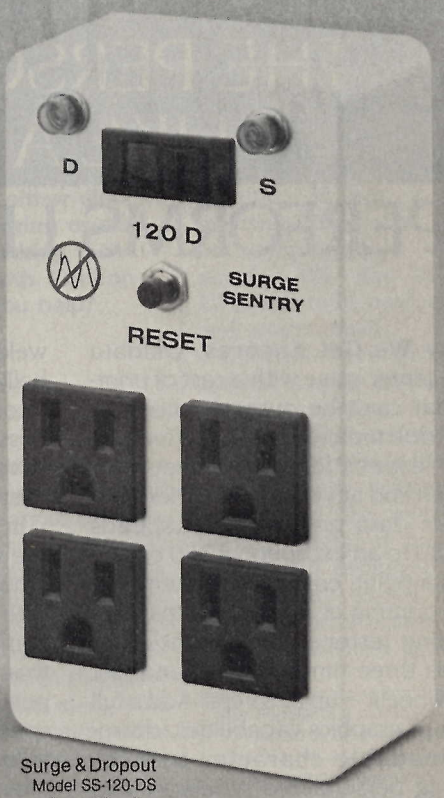
New 3-stage, 3-way common mode ***SurgeSentry***® kills high-speed, high-energy *transients within picoseconds* (trillionths of a second) *before* they can destroy your data, disrupt programs or damage valuable equipment. Certain types of equipment are susceptible to damage when the power line voltage suddenly drops to a low value, or goes out altogether, and then comes on again in a power-up surge. With the Surge & Dropout model, when power drops below a safe level, the unit shuts off. This allows you to check and reset your equipment before returning power. Indicator lights tell you at a glance if a dropout has occured. Power is restored by pushing the SurgeSentry's 'reset' button.

Industry-leading response speed, high energy dissipation (up to 1,500,000 watts at 100 microseconds) and proven dependability mean real, plug-in protection from the variations occuring daily on all power lines. And the economical SurgeSentry is backed by a 2 year warranty.

Designed to protect both large and small systems, the SurgeSentry line includes a Systems Controller model for easy power up, a Master Switch noise filter unit for EMI/RFI protection and central station and NEMA-plug versions for large system installations and UL and CSA Listed models.

Ask for SurgeSentry at your local computer or electronics dealer. For more information about SurgeSentry products and for clear answers to power related questions—call your *toll-free "hotline" at* **(800) 892-1342.** In California, call **(408) 438-5760.**



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The best hardware for

TeleVideo versus IBM. Make a few simple comparisons and you'll find there is no comparison.

RUNS IBM SOFTWARE.

With the TeleVideo® IBM Compatible line—PC, XT and portable computers—you'll get the most out of all the most popular software written for the IBM® PC—more than 3,000 programs.

Because every TeleVideo Personal Computer offers the highest level of IBM compatibility on the market

THE BEST HARDWARE FOR THE BEST PRICE.

Features	Tele-PC	IBM PC	Tele-XT	IBM XT
Monitor	YES	OPTIONAL	YES	OPTIONAL
Screen Size	14"	12"	14"	12"
Tilt Screen	YES	NO	YES	NO
Quiet Operation	YES (NO FAN)	NO	YES	NO
Memory	128K	128K OPTION	256K	256K OPTION
Graphics Display (640x200 resolution)	YES	OPTIONAL	YES	OPTIONAL
Printer Port	YES	OPTIONAL	YES	OPTIONAL
Communication Port	YES	OPTIONAL	YES	YES
MS™-DOS/BASIC®	YES	OPTIONAL	YES	OPTIONAL
System Expansion Slot	YES	YES	YES	YES
RGB and Video Port	YES	OPTIONAL	YES	OPTIONAL
Typical System Price	**$2995**	**$3843**	**$4995**	**$5754**

compatibles. the best software.

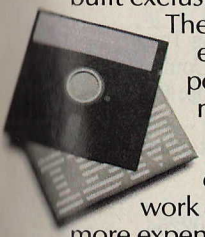
and has the standard—not optional—features you need to take full advantage of every job your software can do.

Study the chart at the left. It proves that TeleVideo—not IBM—offers the best hardware for the best price.

Note that TeleVideo's ergonomic superiority over IBM extends from fully sculpted keys and a comfortable palm rest to a 14-inch, no glare screen that tilts at a touch.

THE BEST MICROCHIPS.

What is perhaps most impressive about the TeleVideo IBM PC Compatible can be found deep within its circuitry. We use the same 8088 central processing unit that runs an IBM PC. But we also employ new VLSI (Very Large Scale Integration) microchips that are designed and built exclusively for TeleVideo. These interface more efficiently with the powerful 8088 and yield numerous benefits.



For example, our tiny custom chips do the work of many of the larger, more expensive circuit boards in an IBM PC. So we can offer a computer system that comes in one attractive, integrated case, is ready to run and occupies less desk space. A computer that edges out IBM's added-cost component system for reliability, ease of service and purchase simplicity.

Fewer circuit boards to cool also allowed us to eliminate the noisy, irritating fan IBM and most other PCs force you to put up with. And TeleVideo compatibles accept any IBM hardware options without modification.

THE BEST PORTABLE FOR THE BEST PRICE.

Features	TPC II	COMPAQ
High Capacity Storage	YES	NO
2nd Disk Drive	YES	OPTIONAL
Quiet Operation (No Fan)	YES	NO
Ergonomic Display	YES	NO
Communication Port	YES	OPTIONAL
International Power Supply	YES	NO
MS™-DOS 2.11	YES	NO
Graphics Display	YES	YES
Typical System Price	**$2995**	**$3710**

THE BEST LINE.

But the Tele-PC is only one element of the TeleVideo IBM PC Compatible line.

The TeleVideo XT is the best hardware for users of popular IBM XT software who would appreciate an extra 10 megabytes of storage capacity along with the advantages listed on the preceding chart.

As the chart above demonstrates, our portable IBM compatible computer, the TPC II, is far and away better hardware than COMPAQ.™ Better hardware—standard—at a better price.

THE BEST MANUFACTURER.

The TeleVideo IBM PC Compatible line is made by the world leader in multi-user computer systems and the number one independent manufacturer of terminals.

Our compatibles are available at participating ComputerLand and Entré (call 800-HI-ENTRE) dealers or you may call 800-538-8725 for the dealer nearest you. In California, call 800-345-8008.

Before you invest, make a few simple comparisons. You'll find that TeleVideo—not IBM or COMPAQ—has the best hardware for the best software. At the best price.

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595-9998. For Apple computers ($149) and the IBM Personal Computer ($164).

Most of these programs require computers with one or more disk drives for operation, and some are rather expensive. If you are a serious investor, you should choose the program that meets your long-term needs. The computer will result from your software choice, but it will not be an "unsophisticated" one.

Once you have selected a system, you can obtain stock market data from any of several information services through the use of a modem and a standard telephone line. You need only dial the appropriate information service and place the modem on-line. Data can then flow into your computer and be manipulated as required.

The three most frequently used information services that provide stock market data are Compuserve Information Service, Dow Jones News/Retrieval Service, and The Source. For full information on these three services, see page 156 of this month's Special Report on Telecomputing.

I'm a novelist, so I get a lot of word processing use out of my Xerox 820 personal computer. But lately I have become interested in its other capabilities. Where can I find software, especially business programs, for my system?
Daniel T. Streib
San Diego, CA

The fact that your computer runs the CP/M operating system enables you to choose from a large variety of programs. This is because CP/M is generally considered a hardware-independent disk operating system that allows software written for one machine to run on another. A part of the CP/M system known as the basic input/output system (BIOS) compensates for the differences between computers. The problem is, however, in getting a program from one machine into the other.

Originally, CP/M used an 8-inch disk format, but most new computers use the more popular 5¼-inch format. Unfortunately, not all 5¼-inch formats are identical, so a disk from one system may not be read by another system. To make matters worse, there are almost as many disk formats as there are computers.

However, Lifeboat Associates (1651 Third Ave., New York, NY 10028 (212) 860-0300) distributes a wide variety of CP/M software for business applications that will run on almost any computer. Many formats are supported and a comprehensive catalog is available.

Also, CP/M software can be transferred from one computer to another using a modem. A telecommunications program is also required for each computer to transmit and receive the software. This method allows you to take advantage of the huge library of public-domain software that is available. Contact CPMUG, the CP/M Users Group at the Lifeboat address above.

I live in a mobile home park where the line voltage is often too low for proper operation of my Franklin Ace 1200 computer. Is there anything I can do?
George F. Barth
East Hampton, NY

Common power line problems that affect the operation of computers include blackouts, brownouts, "sags and surges," and constant low voltage. Proper identification of these problems will determine the most cost-effective means of system protection.

A blackout is a complete loss of power. While some blackouts last only a few seconds, data loss occurs in milliseconds. In addition, the surge of power returning to the line can severely strain hardware components. On the positive side, blackouts account for only a small percentage of the power problems in most of the United States.

A reduction in line voltage of 5 to 15 percent is called a "brownout" and can last from a few hours to a few days. Brownouts are created by the utility companies during periods of high energy demand. Rather than cut off power to one area of the distribution grid, line voltage is reduced equally for all customers.

Voltage sags and surges are induced by faults on the power line and their subsequent correction by fault-clearing devices. Heavy loading, as caused by a motor start-up, also creates this problem. If the lights occasionally dim, voltage sags are to blame.

The normal voltage drop between the generating station and the user at the far end of the line is a simple explanation of constantly low voltage, and contacting the utility company may bring the fastest solution. Public utility companies are required by law to maintain line voltage within specified limits, and, upon request, will take measurements at your location. An additional line transformer or tap change may be all that is required.

The most common solution for fluctuating line voltage is the AC line voltage regulator. This is basically a "smart transformer" that senses voltage changes and increases or decreases the voltage accordingly. The two most common types include a ferroresonant constant voltage transformer and an electronic tap changer.

Manufacturers of ferroresonant transformers include:

General Electric Co.
Specialty Transformer Dept.
1701 College St.
Fort Wayne, IN 46804

Isoreg Corp
41 Great Rd.
Littleton, MA 01460

Sola Electric
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Elk Grove Village, IL 60007

The Electronic Tap Changer transformer is manufactured by Topaz Inc., 3855 Ruffin Rd., San Diego, CA 92123.

Neither of the above transformer types is effective in the case of a total blackout. If this problem is of concern, an uninterruptible power supply (UPS) will provide the necessary power. A UPS is a device that converts AC current to DC and then converts the DC back to AC. At the DC point is a battery that is constantly in the circuit and fully charged. In the event of a power outage, the battery is immediately on line to supply power to the computer until all files can safely be saved. A system's auxiliary power may last a few minutes to several hours. When the power returns, the battery automatically goes back on charge and is ready to handle the next outage.

Manufacturers of UPS include:

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Is there any way that I can turn my Smith-Corona Electra C/T electric typewriter into a letter-quality printer for my computer?
Oliver Noble

Your electric typewriter is basically a manual typewriter with an electric assist. As you depress a key, a motor is activated to reduce the effort required. There is no means of electrically driving each key, and no encoding mechanism, so direct computer control through an internal means is impossible. □

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The dial-up and sign-on process is exceptionally easy. The ACCESS main menu lists the major services *and* allows you to add any service you want.

So all you have to do is enter your password and the local phone number of the desired service.

ACCESS can even remember to do all this for you. So you can automatically connect to any service with only two keystrokes!

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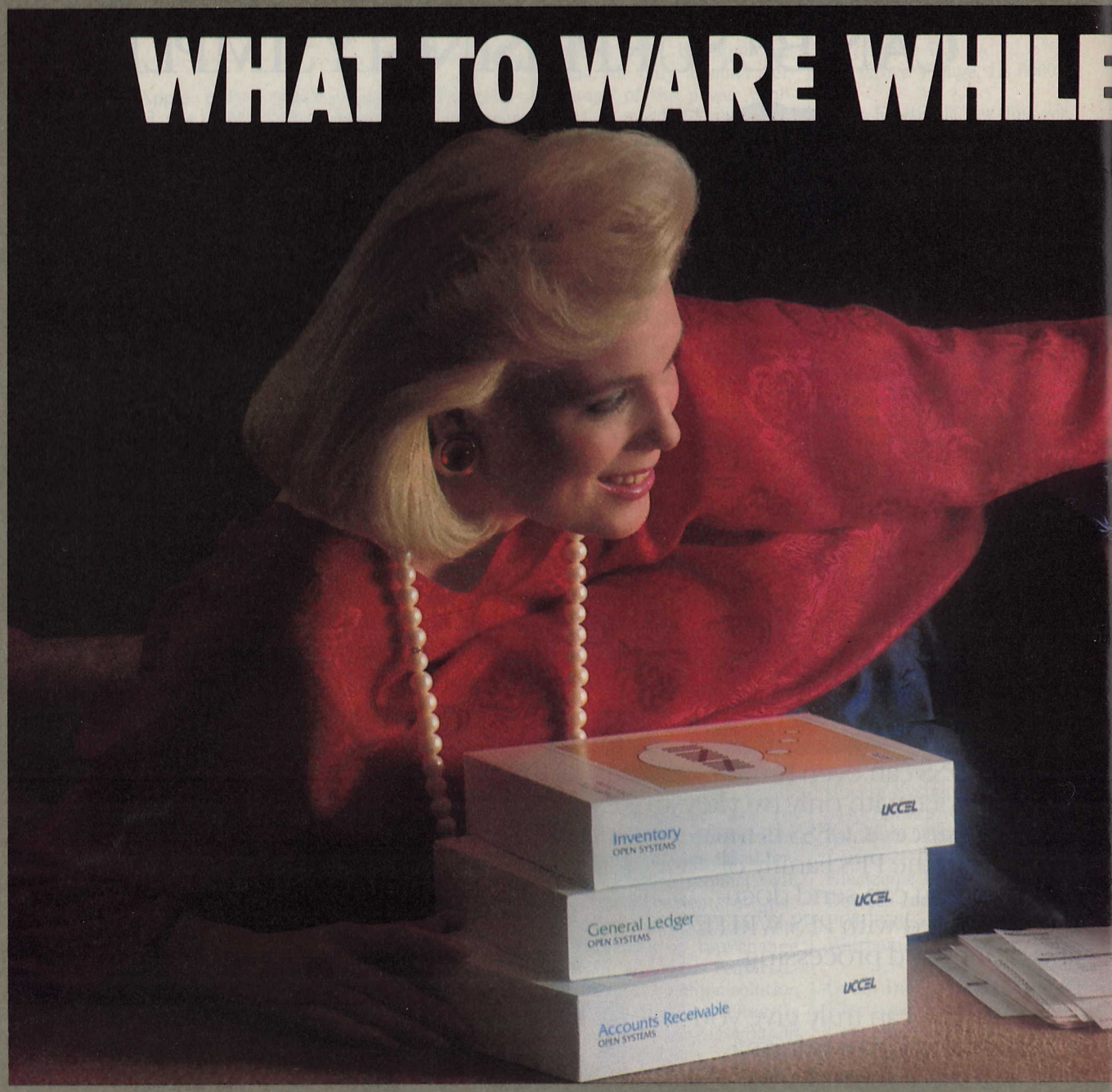

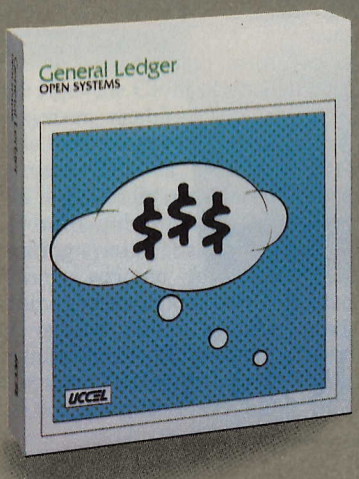

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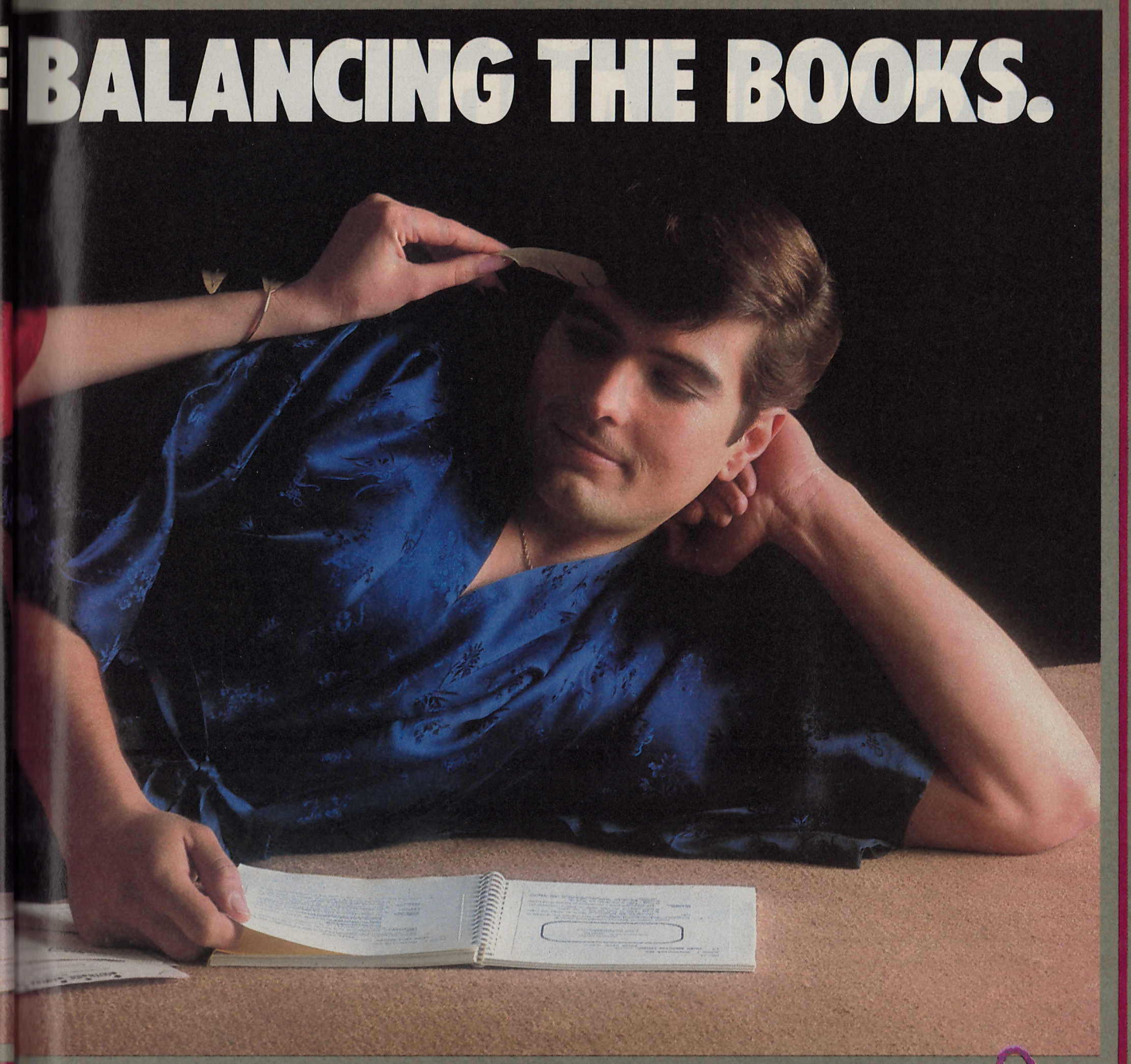

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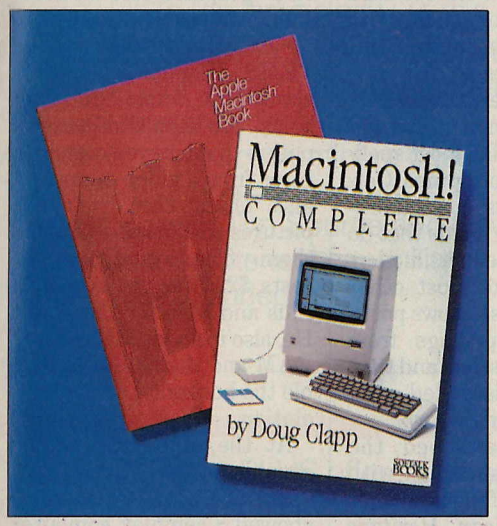


New products for the Mac included books, software, and hardware.

The 9th West Coast Computer Faire held in San Francisco this spring attracted overflow crowds of computer enthusiasts including thousands of kids, hackers, and business people alike. This was the first West Coast Computer Faire run by New Jersey-based Prentice-Hall, which has purchased the show from industry pioneer Jim Warren. Prentice-Hall had announced its intention to give the normally flamboyant show more of a staid business orientation, leading many to believe we were about to witness the end of an era. But the attendees—both companies and show-goers—refused to let the old spirit die. They came to do business, yes, but primarily to have fun.

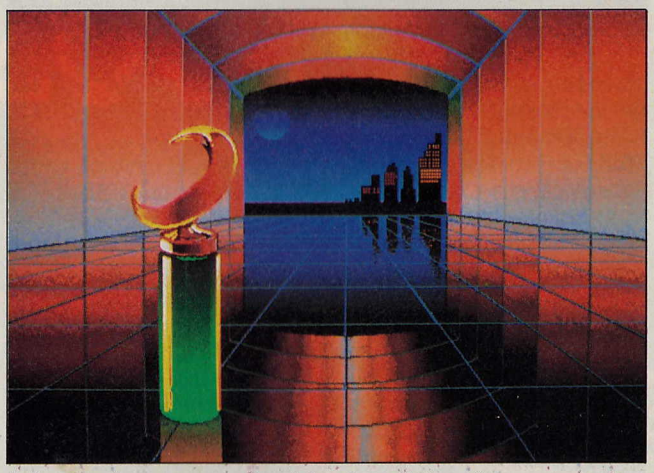
Alumni from previous Faires may have missed seeing Warren zip through the aisles on roller skates and some of the far-out exotic booths of the past that included such attractions as laser light shows. And some show-going veterans surely experienced identity crises when they encountered the wall-to-wall carpeting on the auditorium floor. Nevertheless, over 300 exhibitors, including dozens of small companies, displayed everything from new Macintosh products to computer coloring books.

• IF THIS SHOW is a paradigm of the industry, we can say that the IBM tidal wave has subsided or at least lost its hurricane force. IBM had a booth, as did several companies offering PC add-on cards and software for the PC and the PCjr. But Big Blue did not dominate this show. An amusing moment came when a youthful show-goer approached an IBM sales rep and asked, "Can I see the Macintosh?"

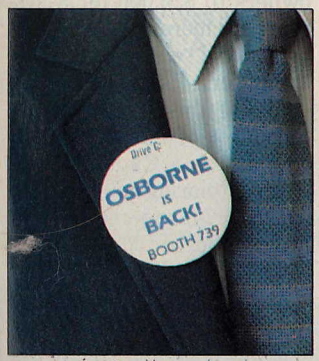
The Apple booth was directly across from IBM and it was by far the most crowded. Apple's magnet was none other than its "Big Mac," an 11- by 8- by 7-foot mastodon model of the Macintosh computer with a 4½- by 6-foot screen. A projection system inside Big Mac was connected to an actual Macintosh from which Apple ran a demo of MacDraw, Apple's new graphics program that allows you to create multiple lines and objects, change their size and shape, and fill them with different patterns.

• SOFTWARE development for the Macintosh is continuing at a rapid pace, that is if the hordes of "Macintosh Development Team" banners hoisted at several booths and the hundreds of companies now claiming entry in the field are any indications. However, not many programs were complete by showtime.

In the games area, Penguin Software (Geneva, Illinois) introduced a Macintosh version of Transylvania, an adventure game where you seek to rescue Princess Sabrina and in so doing encounter a weird melange of vampires, werewolves, and other creatures. Penguin plans to convert other games in its lineup to the Mac format, including The Quest and The Coveted Mirror. Also vying with Penguin for Mac games is Sir-



Advanced computer graphics from Time Arts.



Back by popular demand.

Ed Crabtree

Computer graphics (right) © 1984 by Time Arts and James Dowlen

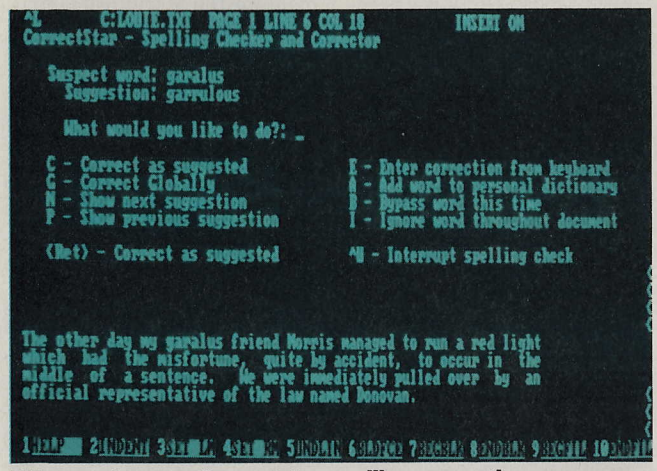
Ed Crabtree

← Circle 45 on inquiry card.

Tech (Ogdensburg, New York), which plans to release at least one of its popular Wizardry games by late fall.

The first FORTH language for the Mac was announced by Creative Solutions Inc. (Rockville, Maryland). The program is a reworking of the firm's Multi-FORTH and is designed to take advantage of the Mac's unique features. A level 1 system is available for $149, and a level 2 system including assembler and advanced graphics is $249.

Keynote speaker Bill Gates, chairman of Microsoft, confirmed that several bugs had been located in his firm's Multiplan spreadsheet for the Macintosh. He promised that buyers would receive a free update of the program.



Micropro's new Correctstar spelling-correction program.

Nexa Inc. (San Francisco) offered a Client Billing system for the Mac that enables you to maintain client files and calculate your billable hours as well as print Gantt charts, maintain expense reports, and measure the time you spend with a client. The program, which interfaces with Multiplan, will be available this summer for between $100 and $150.

Also introduced was a Macintosh product that provides you with a phone and software to manage and dial hundreds of phone numbers. Magicphone, from Artsci Inc. (North Hollywood, California), enables you to record and print the details of each call you make. You use the mouse to make your selections. Magicphone plugs into the Mac speaker jack and into your phone line. The system sells for $200.

Tecmar Inc. (Solon, Ohio) introduced two 5-megabyte hard-disk systems; one uses a fixed disk, the other removable cartridges. The company consulted with Apple on its design, according to Macintosh engineers Burrell Smith and Andy Hertzfeld. The hard disks should sell for about $2000 and be available by this summer.

Two new Macintosh books that look promising are *The Apple Macintosh Book* by Cary Lu, microcomputer editor of *High Technology* magazine, available for $18.95 from Microsoft Press (Bellevue, Washington) and *Macintosh! Complete* by Doug Clapp, columnist for *Infoworld* magazine, $19.95 from Softalk Books (North Hollywood, California).

According to Larry Tesler, a project leader at Apple for the Macintosh and Lisa, Macintosh computers with 512K-byte RAMs are in the works. For those who already have the 128K versions, upgrades will be available "for a price." Although Tesler wouldn't say when the 512K Macs would be available, expect them by the first quarter of 1985.

• SEVERAL FIRMS introduced new products for IBM machines. At one of the very crowded booths, Borland International (Scotts Valley, California) demonstrated a $49.95 version of its Turbo Pascal for the IBM PCjr. Tall Tree Systems (Palo Alto, California) showed its JRAM-2 add-on board for the PC with memory ranging from 512K to 2 megabytes.

Micropro International (San Rafael, California) introduced Correctstar. Like most spelling-correction programs, Correctstar checks a word-processing file for words that do not match those in its dictionary. But unlike most other programs, it also shows possible correct spellings from which you can select and then replace the misspelled word by hitting a single key.

Micropro developed the package in conjunction with Houghton Mifflin, publisher of the *American Heritage Dictionary*. The product uses a 65,000-word dictionary, which includes 99 percent of the most frequently used English words. Correctstar will replace Micropro's Spellstar in most of its packages for 16-bit computers, although the older spelling checker will still be offered for 8-bit machines and machines with less memory than the 192K bytes required for Correctstar. Micropro offers the new product for the IBM PC, Tandy TRS-80 Model 2000, DEC Rainbow, and the Texas Instruments Professional for $195. Spellstar owners can buy an upgrade for $85.

• ONE OF THE biggest surprises at the show was the simultaneous return of both Adam Osborne and Osborne Computer Company. Mr. Osborne was at the show drumming up support for his new company, Paperback Software, which will distribute software from independent companies through bookstores. Osborne Computer's booth displayed the new transportable IBM PC-compatible computer. Although the machine is not available yet, while the company is reorganizing after its recent declaration of bankruptcy, it is expected to be on the shelves later this year for "under $3000." The exhibit model featured a 7-inch amber display, 256K bytes of RAM, two double-sided double-density disk drives, color graphics, and an RGB composite video output.

• COMPUTECH SYSTEMS (London, England) showed a video digitizer board for Apple microcomputers that lets you store pictures from a video camera on disk. You can then display the pictures on a monitor or print them. The system, which costs $295 for the Apple II Plus and $495 for the Apple IIe, also includes 64K bytes of RAM and the ability to double the horizontal display resolution.

At the other end of the graphics scale, Time Arts (Santa Rosa, California) showed a complex computer art and production graphics system with which you use a digitizing pen and tablet to create images on an RGB color monitor. You can store and recall those images and combine them in different patterns; you can also manipulate the objects you have drawn, including copying, moving, rotating, and rescaling them. Time Arts offers a series of products, including basic drawing packages and those that allow you to design custom fonts and create animation. Prices for complete systems range from $6000 for current IBM PC owners to $25,000 for a system with more advanced software and a Zenith Z120 computer.

One of the first handouts that a lot of Faire-goers received was a Captain Computer Coloring Book published by Management Information Source Inc. (Portland, Oregon). The $6.95 book is designed to teach young kids about computers by detailing the adventures of a daring comic book character named Captain Computer and his sidekick, Micro Mouse. □

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Unattended remote test capability	Yes	**No**
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Las Vegas Tests Computer Gambling Games

In case you haven't heard, business in America's gambling capital, Las Vegas, is down—way down. Competition from Atlantic City, the recent recession, and changing attitudes have all combined to bring hotel and casino profits down to near-record lows. In an attempt to bring some much-needed pizzazz back to the Strip and downtown gambling centers, casino operators have embarked on a project they hope will transform today's video-game addicts into tomorrow's gamblers.

Some 25 percent of Nevada's 90,000 gaming machines are now computer-based, and industry experts estimate the figure could reach as high as 80 percent within a few years. "Gaming must grow to keep up with the challenge of the times," says Jim Avance, chairman of Nevada's Gaming Control Board. "With video games now entering every corner of modern society, it shouldn't be surprising that they are becoming a part of gaming too."

Typical of the new generation of high-tech one-armed bandits is Gold Fever, a game that features an animated prospector digging for gold. After plunking in $3, the player chooses between three mines: one offering riches, another a fire-breathing dragon, and the third a deadly box of dynamite. If the player makes the right choice, he can quit with his winnings or move on to higher levels. Making the right moves can bring a return as high as $1000. Gold Fever marks the first time the state has approved for testing a gaming device that does not feature such traditional gaming symbols as cards, dice, or fruit.

The machine is one of a number of computer/video gambling devices made by International Gaming Technology Inc. The Reno-based company builds over 12,000 machines annually and has gross sales of about $75 million. IGT president George Drews admits he's targeting his units at video-game players. "We would like to have something for the video generation when they come of age. We think it will take something a lot more interesting than just the ordinary reel-type slot machines," he says.

But some observers worry whether Gold Fever will be too attractive to minors. Operators of the four casinos where the machine is being tested have been warned to watch if kids are playing, even though children are restricted from casinos by state law.

Avance downplays fears that young people will see the machine as just another video game, noting that the unit will be prohibited from convenience stores, video arcades, and other places that attract teens. "Times are changing," he says, "and the state of Nevada must go with the flow. The manufacturers and casinos should be encouraged to come up with every type of gaming device they can. It's then up to the consumers to decide on the viability of these machines."

Once the field testing for Gold Fever has been completed, state officials plan to study the game's attractiveness to players, the amount of cash it earns, its payoff rates, and whether the device can be easily cheated.

"Moving away from traditional gambling devices is bound to be a shock, but there's no turning back now," says Avance. □

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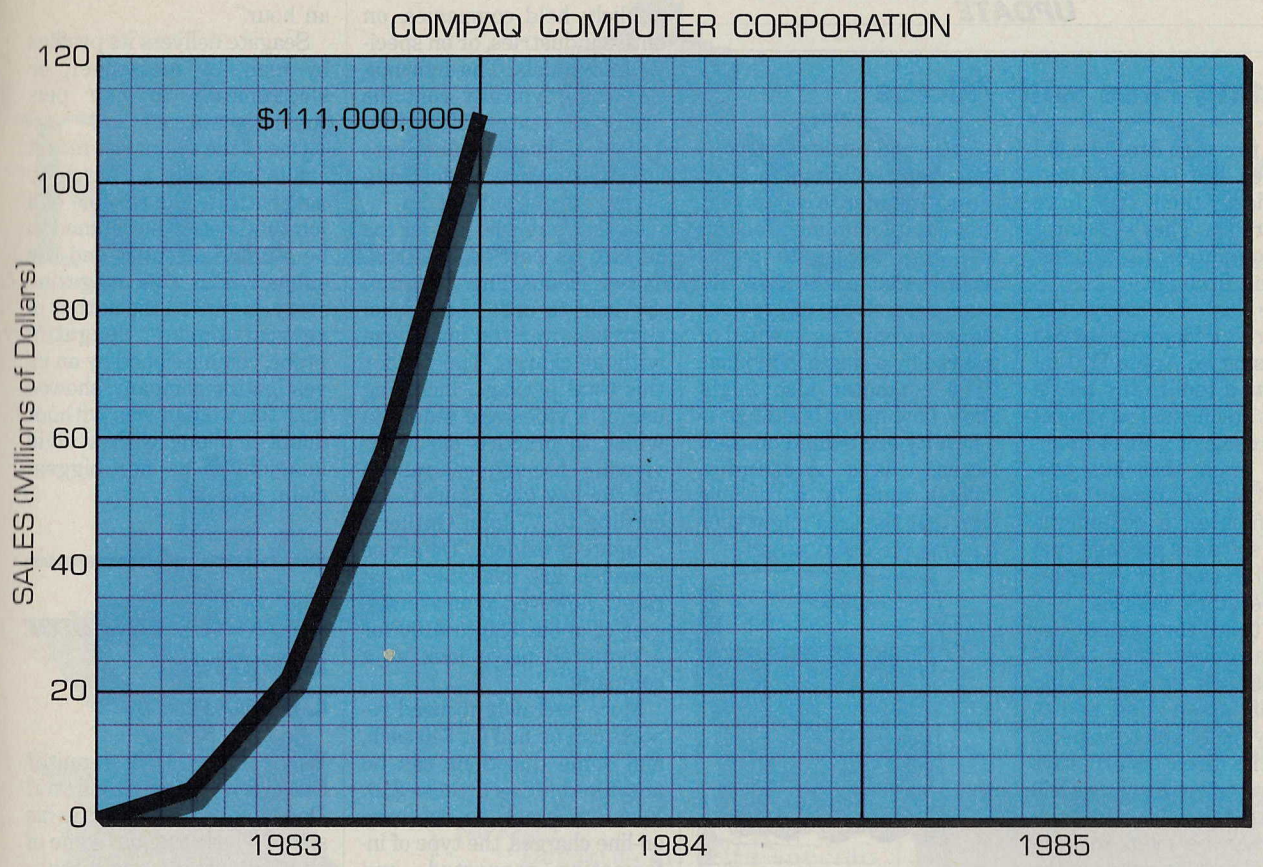

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It simply works better.

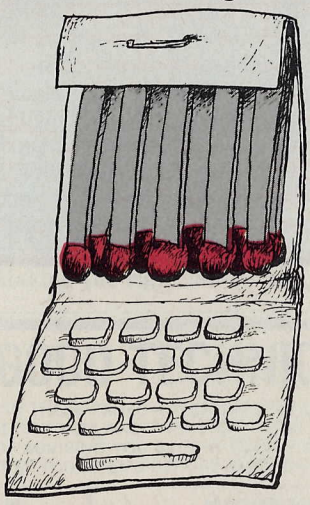
Fighting Fires with Micros

"Fight fire with fire," the old saw goes. But Dayton, Ohio, fire officials think they have a better idea. They're using a microcomputer to combat fires and firebugs.

Since last February, the Dayton Fire Department has been using an Apple II computer as a tool in the battle against arsonists. The project is the result of a Ford Foundation grant that has provided the department with the computer, a custom-designed software package, and $18,000 in cash for expenses and operator's salaries.

"We think the system can help us prevent fires before they happen by identifying potential arson sites, and to identify likely arson suspects after the fires occur," says Fire Protection Engineer Bill Ford. During 1984, the computer will be used to scan potential problem areas in the southeast Dayton neighborhoods of Huffman, St. Anne's Hill, and South Park. By late next year, the department hopes to have all of Dayton under the computer's scrutiny.

"It's important to consider the neighborhood perspective along with the crime perspective when formulating arson prevention strategy," says Dayton Fire Director Glenn Alexander. "We think the computer is a right step in that direction since it will allow neighborhood officials to enter and retrieve information about buildings in their areas." In order to collect relevant data, community leaders will have access to public records that could show, for example, a string of previous arsons at buildings owned or insured by a single individual. "The computer also might show how many buildings in a locality are behind on their taxes," says Alexander, "which could be a warning sign that the area might soon become an arson target.



"I think the computer is destined to become an extremely critical component in the war against arson," Alexander continues. "It's all a matter of collecting and sorting information in a way that identifies the individuals who are torching our neighborhoods." □

Customizing Your Job Interview

Picture this: you have a job interview set with the hottest manufacturer of widgets in the country. But, alas, you don't know anything about the company or anything about making widgets.

Have no fear. Within just 24 hours, you can get a complete printed profile of the company, and the ins and outs of widget making, with The Searcher's Answer provided by Seagate Associates Inc., a Paramus, New Jersey, executive career counseling firm.

Seagate uses an Apple III microcomputer to electronically search hundreds of databases and provide detailed reports on private or publicly held companies, on entire industries, or on specific individuals. The information folio typically contains financial statements, biographical data, and abstracts of magazine articles focusing on the target subject.

Job seekers who pay for the service as part of Seagate's career counseling program are free to order additional searches over the long term without charge. The fee for this total package, including use of a videotape studio in which to practice job interviewing techniques, ranges "in the low four figures," according to V. John Guthery, Seagate president. Database searches are available separately, however, at an average cost of about $80 to $100 for a comprehensive look at a company.

More narrowly focused reports can be had for $40 each, and some questions can be answered for as little as $10. Fees are based on database on-line charges, the type of information requested, and Seagate researchers' time.

The Searcher's Answer isn't limited to job hunters; the international service is available to anyone who needs facts fast.

Claudia Gentner, Seagate vice president who conducts most of the searches, uses a Hayes 1200-baud modem and telecommunications software from Microcom Inc. She primarily accesses Lockheed Corp.'s Dialog Information Service databases, along with others that furnish biographies and summaries of stories carried in the press.

"The basic advantage of this service is time savings—and that, of course, means cost savings," notes a Seagate customer. "One search they handled for me involved a company one of my clients was interested in acquiring. Ordinarily," he says, "I would have had to pay an employee three weeks' salary plus expenses to travel around to gather the information. But the electronic search cost me only about $250, and the report was in my hands within an hour."

Seagate delivers its profiles by mail, by messenger, or electronically to your personal computers.

One of the company's recent challenges was a search to authenticate the résumé of a job candidate who claimed to be a noted scientist and the subject of a *Life* magazine story as well as the author of several books. Seagate's probe, commissioned by an investigating company, showed that the woman was without doubt a phony with a vivid imagination as her biggest claim to fame. □

National Enquirer Discovers Computers

Will Liz and Dick reunite? Can tight underwear kill you? Does J.R. talk to ghosts in his sleep? These are just some of the questions regularly tackled by the *National Enquirer*. Gossipy articles have long been its staple. But what happens when the supermarket tabloid turns its attention to personal computers? The resulting articles, as you might expect, are fascinating and almost predictable.

Take the *Enquirer*'s January 31, 1984 edition, for example. A page 2 headline screams, "Home Computers New Threat to Marriages!" The story goes on to tell how personal computer "love triangles" are wrecking happy homes across the nation. Almost 15 percent of all divorces can be connected to home computers, declares an unnamed study cited by the paper. And why do micros have such an unhealthy influence? Jean Hollands, a Mountain View, California, marriage counselor tells *Enquirer* reporter Eric Faucher, "Many men have logical minds and find that the computer is a perfect 'mate' for them. Wives can't compete with the home computer because it is an ever-available

Illustrations by Iosif Teodorescu

READ ONLY

A review of the IBM Personal Computer family. Summer 1984

UP AND RUNNING

And Swimming, Building, and Baking. Building and baking? They don't produce gold medal winners, but they do figure in staging the Olympic games. So do 200 IBM Personal Computers (including software) that are part of IBM's sponsorship of the 1984 Olympics in Los Angeles. In fact, IBM PCs are hard at work in both sports and administration.

PCs are involved in a wide range of planning and analytical activities, though they don't provide official results of the various athletic events. Some events, for example, use the IBM PC to determine how competitors are seeded—who competes against whom. In other events, such as archery, the PC simplifies the complex task of recording scores and compiling statistics for each athlete as the competition progresses.

In events like gymnastics that depend on points awarded by judges, statistics can be kept on the PCs to analyze scoring consistency. Also, a whole range of information about individual athletes, past Olympics, and world and national records, both past and present, can be quickly recalled and compared with the help of the IBM PC.

Last but not least, administration. Spreadsheet programs, such as IBM's Multiplan™, were used on the PC for planning and forecasting by nearly every administrative department, from Construction to Ticketing. The same departments speed up some of their day-to-day accounting tasks with the help of the PC and IBM accounting packages.

Departments with specific software needs developed special packages with the assistance of a programmer whose services are part of IBM's Olympic sponsorship. Specially designed programs include database management applications to help handle transportation requirements and inventory control programs to keep track of sports equipment and personnel records.

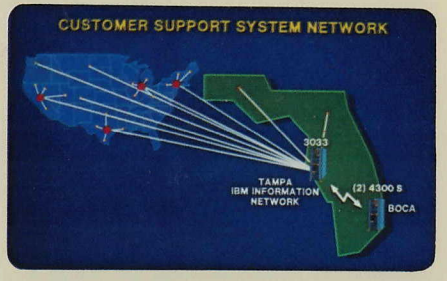
In short, there's hardly an area of planning and staging the 1984 Summer Olympics that the IBM Personal Computer doesn't play a part in. Maybe there *should* be medals for administration.

Multiplan is a U.S. trademark of Microsoft Corporation.

ON THE STOREFRONT

A Shorter Distance between PC Points. We're all familiar with the feeling of being lost in the growing maze of new computer products. IBM has opened a path through that maze, straight to the information and answers you need about IBM Personal Computer Products—information about a specific software package or hardware configuration and answers to technical questions.

The key to entering this new information path is the IBM Customer Support System (CSS) at your authorized IBM Personal Computer retail dealer or IBM Product Center. Dealers in over 300 cities throughout all 50 states use the Customer Support System, which includes a nationwide communications network, to help give you instantaneous computer-age service support that's unmatched by any other computer manufacturer.



Colorful Stops along the Way. More than 1,700 authorized IBM dealers have access to a permanent and continually updated directory of IBM Personal Computer product information in IBM's Customer Support System. For a sharp color display of the type and level of information you want, visit your dealer or IBM Product Center and choose from lists of options displayed on an IBM PC color monitor. There are choices that guide you quickly and easily from product directories to in-depth product demonstrations and configuration information.

Since knowing how to take the first step is often a problem, CSS gives you a variety of possible starting points. By selecting the appropriate category—such as printers or business software—you can move to a list of specific products and then to the

Information from CSS with simple one-key commands

product demonstration you want. If you know a product name to begin with—Word Proof, for example—CSS will make an alphabetic search for it. To keep you up-to-date, there's also a special listing for new product announcements.

You can browse through the CSS displays at your own pace, pausing at a given spot or moving quickly backward or forward by using simple one-key commands that are always displayed at the bottom of the screen. One of these commands enables you to make print-outs of any information you wish to save for future reference.

The IBM PC family's color graphics capabilities make the CSS software demonstrations especially impressive. The Multiplan demonstration, for example, consists of several consecutive screens of information. Each screen is split vertically, with representative sections of the actual program on the left and explanatory text on the right. By the time you've seen the entire demonstration, you'll have a good idea of both *what* the program can do for you and *how* it does it.

Answers at the End of the Line. Over 1,000 authorized IBM retail dealers and IBM Product Centers are linked through their Customer Support System to the IBM Information Network. This nationwide communications capability helps your dealer give you fast, efficient service. Warranty claims, for instance, can be handled through CSS with a minimum of paperwork and delay. Dealers also use the network to communicate with other dealers and with IBM to keep abreast of the latest product and service information.

In addition, the CSS network is your gateway to technical information about the IBM Personal Computer family of products. IBM maintains a database on a 3033 mainframe in Tampa, Florida, that your dealer can use to answer—within minutes—a wide range of questions. If the solution isn't on hand in the database, your question can be submitted through CSS to a technical support staff in Boca Raton. There, it will be analyzed and an answer returned through CSS to your dealer.

The information used to answer your inquiry is added to the CSS database, where it will be immediately available for anyone else with a similar question. Your technical inquiries therefore contribute to the growth of the Customer Support System. Its online product information, color graphics displays, and advanced communications all have a single purpose—to help you get the most out of your investment in IBM Personal Computer hardware and software products.

HARDWARE NEWS

Color. There's color news for the IBM PC, IBM PC XT, and IBM *Portable* PC in the form of the IBM Personal Computer Color Printer. It's a high-performance, dot matrix printer that can print charts, graphics, artwork, and text in up to eight colors. The Color Printer produces color graphics that can enhance the appearance of your reports and presentations and make the information they contain even easier to understand. It can also type directly onto overhead transparencies.

The IBM PC Color Printer's range of performance features make it especially well suited for heavy-use/high-productivity applications. A near letter quality printing mode is standard. Printing speeds of up to 200 characters per second can help save time. So can programmable automatic control of print requirements such as print mode, line spacing, and margin and tab setting. These programmable features act as an extension of many software products—word processing programs, for instance—and can be initiated with just a few keystrokes.

A final feature for those who like a personal touch. You can use the Color Printer to personalize your documents by varying the printing modes, character spacing, and boldness. This allows you to differentiate

The IBM PC Color Printer

among headlines, subheads, and quotations and even to print math and science equations.

The Big Crunch. Not long ago, computing and number crunching were nearly synonymous. Personal computers and software for everything from office management to agriculture changed that, but the need for heavy number crunching has hardly disappeared. If it's still a part of your computer workload, the IBM Personal Computer 8087 Math Co-processor can help speed up your calculations.

The 8087 is a floating point co-processor that multiplies, divides, adds, subtracts, exponentiates, and performs trigonometric and logarithmic functions. It works together with the PC's 8088 processor to improve the execution speed of floating point operations by as much as 10:1. The Math Co-processor increases calculation speeds so greatly because it makes floating point operations a hardware rather than a software function.

In addition to increasing the speed—and often the level of precision—of statistical and analytical math packages, the Math Co-processor can improve the display speed of graphics and video games. It also significantly improves high-level language execution time, and is designed to work with the APL Interpreter and the version 2.0 Pascal and FORTRAN Compilers discussed next in this issue.

WHAT'S THE PROGRAM

We Speak Your Language. IBM Personal Computers are shameless polyglots. They can handle most of the popular programming languages you want to work with. Much of the credit for their versatility goes to the IBM Disk Operating System (DOS) 2.10. This updated version of DOS 2.00 was developed to provide support for the IBM PCjr as well as for the IBM PC, PC XT, and IBM *Portable* PC. So all members of the IBM Personal Computer family are united by a single master program that provides the required support between their hardware and a wide range of application programs.

More to our present linguistic point, the DOS 2.10 diskette contains two programs, Disk BASIC and Advanced BASIC, to help you write your own programs on an IBM PC. (IBM PCjr BASIC—a separate, optional cartridge—provides this support for the PCjr.) Disk BASIC adds DOS file support, date, time of day, and communications capabilities to the BASIC language that comes with every personal computer from IBM. Advanced BASIC adds advanced key trapping and advanced graphics—including viewports, windows, and paint tiling—plus music and other capabilities.

DOS has other features that help simplify advanced program development and design, including a line editor, a linker, background printing, and chaining of commands. For help with writing and editing particularly sophisticated BASIC programs, there's the BASIC Programming Development System, a software package that consists of two programs and four utilities. The first program includes a Text File Editor and a Structured BASIC Pre-processor; the second includes a BASIC Formatter and a BASIC Cross-Reference.

Native Translators Available. The IBM BASIC Compiler compiles or translates the BASIC programs you've written, down to native object code so they'll run on your IBM PC. And BASIC is just the beginning. DOS also provides the support you need to develop and run programs using the IBM Personal Computer Macro Assembler or the FORTRAN, COBOL, and Pascal Compilers.*

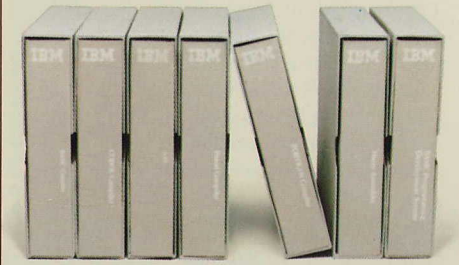
Two of these, the FORTRAN and Pascal Compilers, are available in recently updated versions. IBM PC Pascal 2.0 is based on the ISO standard, and IBM PC FORTRAN 2.0 conforms to the ANSI-77 standard subset level. Both new versions feature improved arithmetic capabilities, and both support the IBM 8087 Math Co-processor for greatly increased speed in processing floating point calculations. (For more about the Math Co-processor, see "Hardware News" in this issue of *Read Only*.)

In addition, versions 2.0 of the FORTRAN and Pascal Compilers feature a Library Manager for creating user-defined libraries and provide easy access to all files in any subdirectory through DOS path support. FORTRAN 2.0 supports linking of object modules with subroutines written in Pascal 2.0 and vice versa. Both new versions support linking of object modules with subroutines written in IBM PC Macro Assembler.

There's a bargain in store for those who already own the 1.0 versions of these compilers: you have the option of buying an upgrade to the 2.0 version at a substantial savings from the full 2.0 price.

To ensure that your programming reach doesn't exceed your grasp, the IBM PC APL Interpreter enables you to write and edit your own programs in APL. It can also be used to exchange data files and workspace between your IBM PC and many mainframe computers.*

Finally, if you're inclined to make serious use of the IBM PC's array of programming aids, we suggest that you also take a look at the recently announced IBM PC Sort program. It provides support for data types and file organizations used by the IBM DOS-supported languages mentioned above and can significantly speed and streamline your programming efforts.

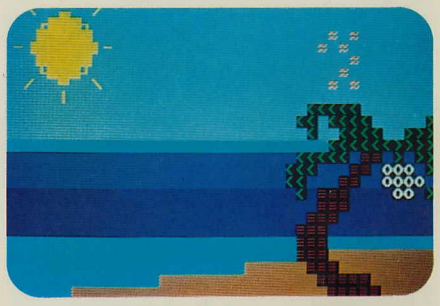


Application development tools from IBM

IBM PC Sort can be used as a stand-alone utility, integrated into a batch job stream, or invoked directly from a COBOL program via the Sort verb. It can sort records from a data file or files, merge multiple input files, selectively include or exclude records, and create an output file containing the records, pointers, or keys from the input files. There are no arbitrary limits in IBM PC Sort for file size, record length, number of keys, or number of input files.

*BASIC Compiler and Macro Assembler will run on the IBM PCjr. APL Interpreter will not. Although the IBM PCjr does not support FORTRAN, COBOL, and Pascal Compilers, most of their output will run on the PCjr if there is sufficient storage.

Now Get Organized. The IBM PC's ability to run a wide variety of commercially available programs and to help you develop your own applications may result in a good news/bad news situation. The good news is that you'll be able to satisfy your application requirements. The bad news is that you'll probably be the one responsible for keeping track of your growing library of programs. If, as we've often found, enthusiasm outstrips organization, you may find yourself falling behind—especially if you're working in an area, such as small business finance or education, where programs multiply rapidly.



Animation Creation software from IBM

Fortunately, help is in sight, in the form of Fixed Disk Organizer, an IBM software package that does just what its name suggests.

Fixed Disk Organizer has a master menu that lets you sort out your various application programs by category—word processing, spreadsheet, communications, and so on. You can tailor the menu to your specific application needs by adding new menu categories, revising or deleting existing categories, or changing titles. The master menu allows you to review all the programs stored on your fixed disk at a glance and to call them up quickly with just a couple of keystrokes.

Fixed Disk Organizer also helps protect sensitive data by allowing you to create passwords and restrict access. It also enables you to write a

string of complex DOS commands into a batch file and execute them whenever you want simply by selecting that file from the menu. And in case part of your organizational problems stem from not always remembering just how things are organized, you can use Fixed Disk Organizer to establish Help files as a reminder.

So we're all in trouble—no more excuses for not being organized.

Moving Pictures and Mathematical Castles. Let's not forget that there's more to life than programming, compiling, and getting organized. There's also software from IBM for pure enjoyment and for enjoyable education. Two such packages are Animation Creation and Adventures in Math.

Adventures in Math incorporates math drills into an adventure game with vivid color graphics of a castle and its passageways and treasures. To find the way out—and to uncover as many treasures as possible along the way—children (or particularly skillful adults) have to solve basic math problems. The program's difficulty level increases as you solve the problems you're confronted with.

Using Animation Creation, you or your children can draw your own pictures and watch them come to life. To draw pictures, you select from 254 computer characters and position them on your screen. Add color by choosing any of 16 foreground and 8 background colors. Then, by slightly repositioning the images on successive screens, you can create animation.

Next stop, Hollywood.

HARDCOPY

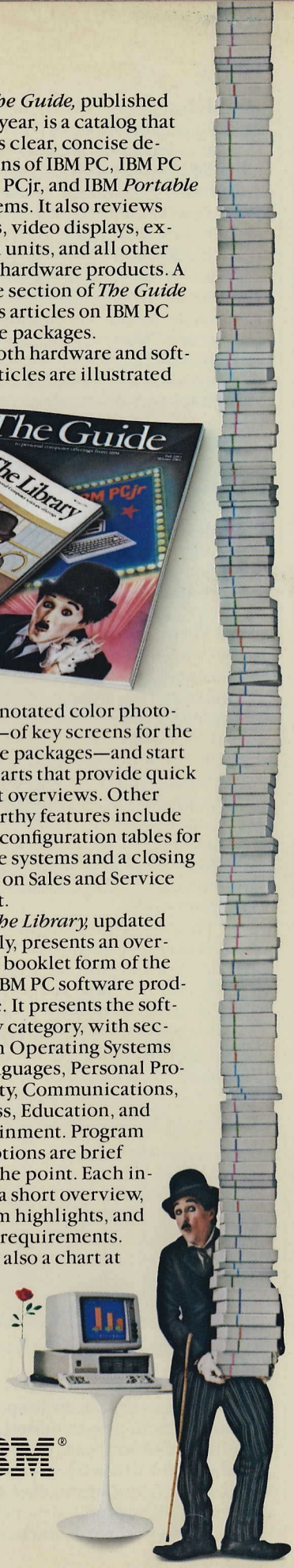
You Can't Enjoy the Game without a Program. Earlier in this issue (see "On the Storefront"), we discussed the Customer Support System for online information about IBM Personal Computer products. Much of that information is also available in two publications: *The Guide,* a directory of Personal Computer offerings from IBM, and *The Library,* a directory of IBM Personal Computer software offerings. If you want to enjoy the personal computer game, these are the "programs" you need to do it.

The Guide, published twice a year, is a catalog that contains clear, concise descriptions of IBM PC, IBM PC XT, IBM PCjr, and IBM *Portable* PC systems. It also reviews printers, video displays, expansion units, and all other IBM PC hardware products. A separate section of *The Guide* contains articles on IBM PC software packages.

Both hardware and software articles are illustrated

with annotated color photographs—of key screens for the software packages—and start with charts that provide quick product overviews. Other noteworthy features include sample configuration tables for all three systems and a closing section on Sales and Service Support.

The Library, updated quarterly, presents an overview in booklet form of the entire IBM PC software product line. It presents the software by category, with sections on Operating Systems and Languages, Personal Productivity, Communications, Business, Education, and Entertainment. Program descriptions are brief and to the point. Each includes a short overview, program highlights, and system requirements. There's also a chart at the end of the booklet that shows at a glance which programs are compatible with the IBM PCjr.



Or the Hardware without a Manual. If *The Guide* and *The Library* are the general road maps to IBM PC products, the *Technical Reference* and *Hardware Maintenance and Service* manuals*—now available in newly updated versions—are the detailed maps of downtown. It's not a trip everyone wants to take, but if you do, these are the right directions.

There's a three-volume *Technical Reference* set for the PC and another for the PC XT and *Portable* PC. These manuals include the functional specifications for the system units and for the options and adaptors in the IBM PC product line. The *Hardware Maintenance and Service* manual details many aspects of troubleshooting a personal computer from IBM. It includes a parts catalog, a section on preventive maintenance, and instructions for identifying the failure of a replacement unit.

*These manuals are intended for use by technically qualified service personnel.

TIPS AND TECHNIQUES

If you use Personal Editor—IBM's full-screen editor for writing programs and brief documents—but find yourself displaying the Help file whenever you forget a function key assignment, here's a little help from the fellow forgetful.

Function key assignments can easily be displayed on the command line of your Personal Editor screen by assigning F1 to display the unmodified keys and alt+F1 to display the alt+Fx keys. You can then assign the Help function to alt+H, although you probably won't need it nearly as often as before.

The macro for the F1 assignment can be written as follows: def f1 = [cursor command] [begin line] 'F: 2=Save 3=File 4=Quit 5=Erase 6=EraseEOL 7=Print 8=Switch 9=InsL 10=Ins&Indt' [cursor data].

For more information about IBM Personal Computer products, see your authorized IBM Personal Computer dealer or IBM Product Center. To learn where, call 800-447-4700. In Alaska and Hawaii, 800-447-0890.

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The Typing Tutor III™ program by Kriya Systems,™ Inc. is the best and most enjoyable way to learn how. This incredibly effective program teaches you touch typing on your own equipment.

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The Typing Tutor III program is available for the IBM PC and compatibles, Apple II/II+/IIe and Commodore 64. Other versions will be available soon, including ones for CP/M-based machines and the Apple Macintosh. You'll find the Typing Tutor III program in computer and book stores, or wherever software is sold. Suggested list price is $49.95.

Typing is your access to your computer—and that's your access to the future.

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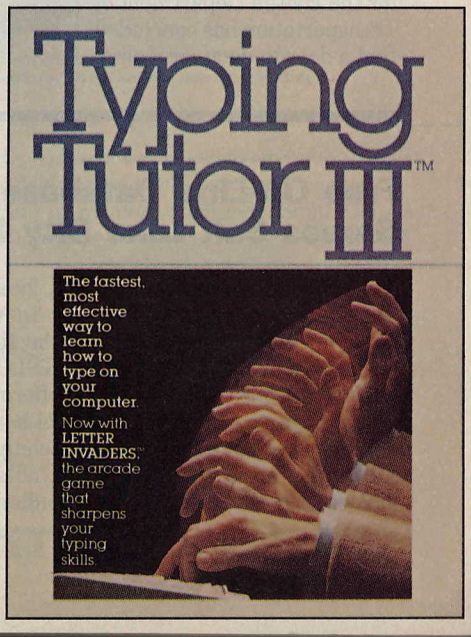


Circle 64 on inquiry card.

servant. It never says 'no.' " Obviously, Hollands has never tried saving data to a write-protected disk.

If that sounds fairly tame for the *Enquirer*, consider a story that ran three weeks earlier under the headline, "Is Your Neighbor a Space Alien?" The tabloid notes the following characteristics as typical of extraterrestrial behavior: ownership of large amounts of expensive high-technology equipment such as computers, an unusual amount of information gathering, irregular sleeping or working patterns, and a highly regarded communications device that's used for contacting the old home planet (a modem, perhaps?).

Fortunately, the *Enquirer* quotes Brad Steiger, "noted UFO investigator and author" as saying, "In my opinion, based on my research, space aliens living here on Earth are on a goodwill mission that will usher in a golden age for humanity."

Something to tell your nosy neighbor the next time he asks why you have all that "computer junk." □

Computer Paradise

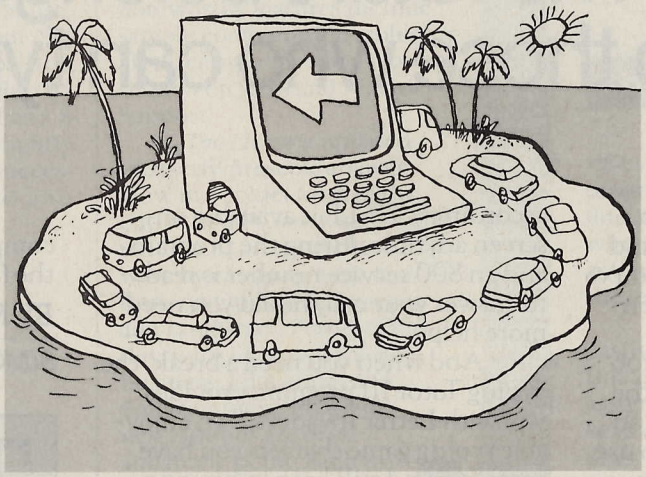
When you think of Hawaii, pineapples, volcanoes, and macadamia nuts spring to mind; perhaps in the near future, free computer terminals will too.

State officials, looking for ways of easing traffic congestion and pollution on the crowded main island of Oahu, are examining the possibility of installing over 300,000 free computer terminals in homes, businesses, and various public places. The terminals would be hooked to an island-wide timesharing network that would coordinate car pools, buses, and taxis.

A federally funded study for the Hawaii Department of Transportation has concluded that a door-to-door carpooling system, organized through a computer network, is both technically and economically feasible for the island of 650,000 persons. The system could cut oil imports and increase mobility for all residents, particularly the elderly and handicapped, the report says.

The computer network "would be a cost-effective way for Honolulu to improve public transportation while simultaneously reducing traffic congestion, gasoline consumption, air pollution and parking problems," the study concludes. The network could also be used for electronic banking, catalog shopping, home education, and electronic mail, all of which would further reduce the need for driving a car, according to the study.

The report pegged the cost of installing a 335,000-terminal system at $201 million. If island fathers could hold off until 1995, when hardware costs are projected to be much cheaper, the price-tag for 369,000 terminals would drop to $101.5 million, states the report.



According to Malcolm McLeod, an economist with the Hawaii Department of Transportation, the government could recoup its investment by opening the system to local advertisements. "I think the service could be largely self-sustaining," he says. "With careful management, I think it could even turn a profit."

But not all island residents take such a positive view. Ron Morita, spokesman for the Oahu Transportation Action Group, claims the system is nothing but a classic waste of public funds. "It's incredible, considering the massive problems facing our islands, that politicians would be so eager to throw taxpayers' money away on such a Buck Rogers-like project," he says. "This would amount to nothing more than a massive boondoggle that would profit a few politicians and computer manufacturers while draining millions of dollars from the public coffers."

Morita notes that videotex systems have yet to prove a potential for breaking even. "Privately run computer networks on the mainland are losing money and dropping out of business by the dozens. Government-supported systems in Europe are also big money losers," he says. "The idea that government leaders here could think their system is capable of making money is nothing less than mind-boggling." □

Free On-Line Database Serves Salt Lake City Residents

Are you looking for an on-line database that provides the latest news, sports scores, feature articles, and stock quotes, but don't want to pay access charges of $5 per hour and up? If you live in the Salt Lake City area, such a service costs nothing more than a local phone call.

In what is believed to be the first system of its kind, KSL-TV in Salt Lake City is offering home computer users 24-hour access to its 50-page teletext magazine, *Teletext-5*. Unlike conventional computer bulletin board systems, which usually offer little more than a central message base and some public-domain software, *Teletext-5* presents its users with up to 17 services, including local, world, and national news, weather, computer news, ski reports, TV and movie guides, and classified ads. As many as 12 users can tie into the system at any time. The database is updated hourly between 9 a.m. and 4 p.m. MST, and can be accessed by dialing (801) 237-1521. No password is required.

"Any kind of home computer can use the service, providing it has a modem and terminal software," explains William Loveless, vice president of engineering for the station. It's a generic service," he notes, "and no special software is required. Two speeds—300 and 1200 baud—

Answer: Smith-Corona

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Question: What printer company offers print quality that challenges printers costing hundreds of dollars more?

Question: What printer company offers dual interfaces for all five of its printer models?

Question: What printer company offers removable and adjustable tractor feeds as standard equipment on all of its dot matrix models?

Question: What printer company has a toll-free telephone number to call if you ever have a problem? And an extensive service system, too?

D-300 (TM) dot matrix printer.

L-1000 (TM) daisy wheel printer.

Ultrasonic III Messenger (TM) portable typewriter with optional Messenger Module.

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D-200 (TM) dot matrix printer.

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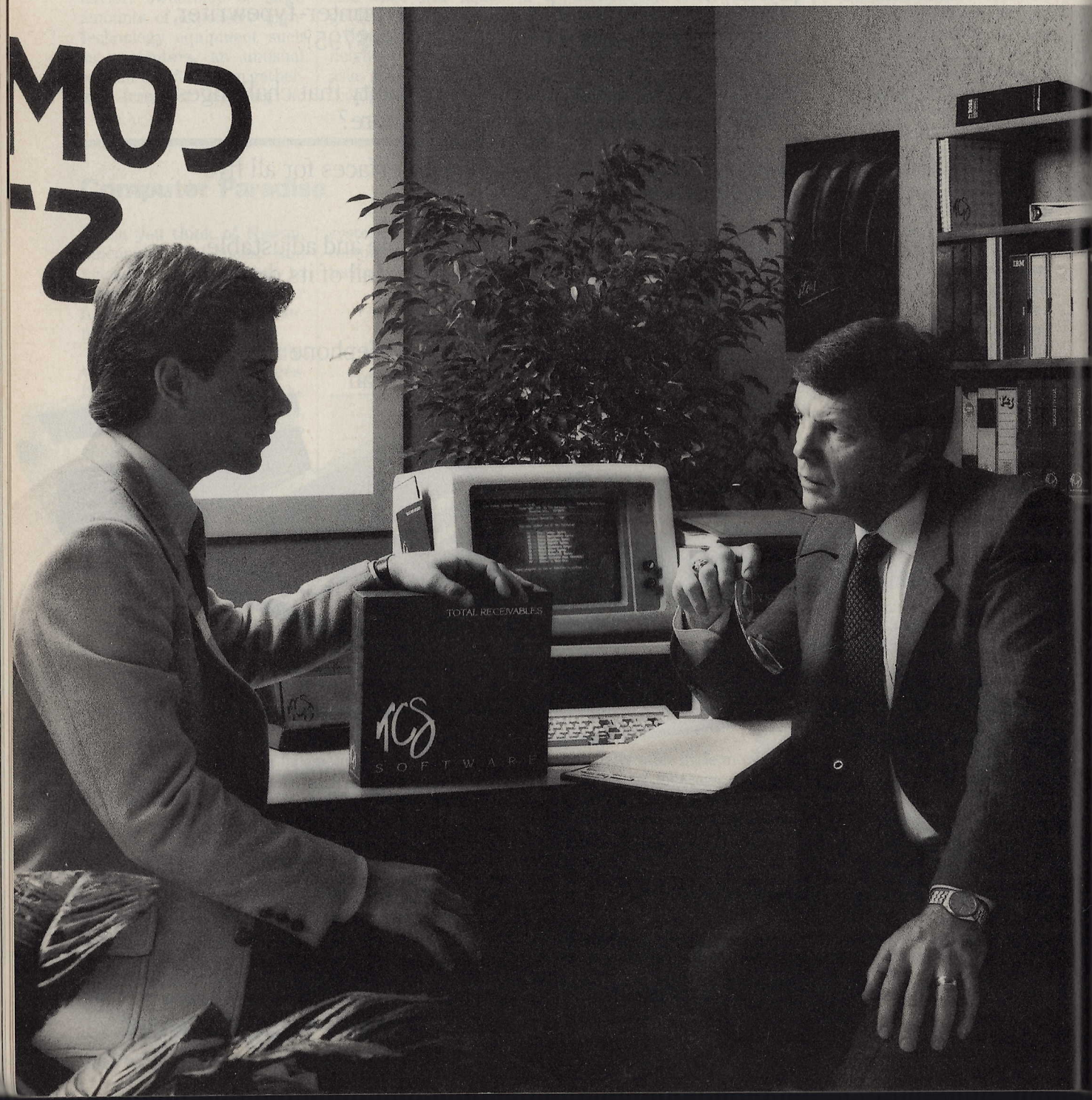

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Add one or more accounting modules, but only when you're ready for them.

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are offered plus a 40-character line." According to Loveless, about 200 users have been dialing into the magazine daily since it went on-line last September 9.

Why is KSL-TV offering its database for free while other information services are raking in hefty fees from users? It's all part of an experiment, says station manager Paul Evans. "We believe the dial-up service involves a group which will be representative of teletext users in the next few years," he says. "Not only does it [*Teletext-5*] identify the viewer's interest in specific categories of information and news, it also serves as a testing ground to determine the most effective text presentation in both format and content."

While *Teletext-5* is currently a money-losing proposition, Evans says the station has started soliciting advertisers in an effort to put the database into the black. The system currently features ads from a variety of Salt Lake City-area businesses, including a large number of computer retailers. The ads are located in their own section of the service and are viewed by selecting the "Telemarket Ads" option from the system's main menu.

According to Evans, KSL-TV plans to experiment with a variety of database features over the next few months, looking to strike upon a combination that satisfies consumers and advertisers. □

Your Own Home Weather Station

If you like to talk about the weather, a company with corporate headquarters in Helsinki, Finland, is giving you a chance to do something about it.

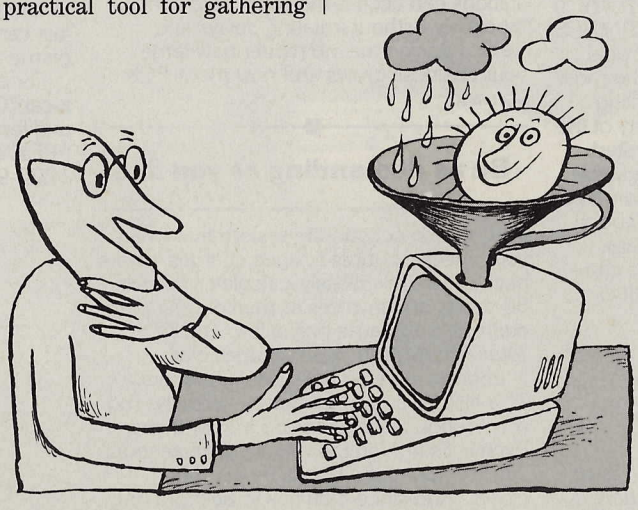
The company is Vaisala and the product is HAWS (an acronym for Home Automatic Weather Station). Vaisala, one of the world's leading manufacturers of meteorological instruments, has satellite facilities in England, Argentina, Japan, and the United States. Its Woburn, Massachusetts, plant produces complete hardware and software packages which interface with VIC 20 and Commodore 64 computers.

HAWS itself is the first of 10 programs provided on both tape and disk. The machine-language program allows data collected by the HAWS sensor to enter computer memory and be available for use with the nine other programs: *Display* provides continuous display on the TV screen of temperature, humidity, dewpoint, and atmospheric pressure, all updated every 15 seconds; *Comfactor* determines the comfort factor, based on temperature and relative humidity data; *Chillfactor*, based on temperature readings from the HAWS sensor and visual observations entered by the operator, provides accurate computation of wind-chill temperatures; *Cloudalt* uses temperature and relative humidity data from the HAWS sensor to determine cloud altitude; *Calc* lets the operator predetermine meteorological parameters and equations, such as calculating dewpoint from relative humidity and temperature readings; *Trend* lets the operator collect and store weather data for up to 36 hours; *Graph* provides graphical display of trend data; *Print* sends data collected from *Trend* to a printer; and *Forecast*, based on HAWS sensor data and data trends, provides the next-day forecast.

Product manager Bennett Lavine says HAWS is more than a toy or a game: "It's a practical tool for gathering weather data to be used in monitoring and adjusting environmental conditions in the home, office, laboratory or greenhouse." The HAWS unit helps maximize energy efficiency by enabling the operator to determine heating and cooling degree-days and coordinate heating and air-conditioning controls accordingly, Lavine points out.

The manual includes guidelines for specialized and custom programming, such as frost forecasting for home gardeners and farmers. The HAWS package with all 10 programs sells for $199.95.

Vaisala is introducing a version of HAWS for RS-232-equipped computers. For more information about HAWS, phone (617) 933-4500. □



FBI Leads Drive to Beef Up Security

A growing concern among government officials over Soviet espionage is prompting the FBI to hold special briefings with high-tech corporate executives around the country. The meetings are part of an overall effort involving the FBI, the Pentagon, the State Department, and the U.S. Customs Service to stem Soviet industrial espionage and the illegal transfer of technology that could be used for military purposes.

One meeting, held recently in the Dallas-Fort Worth area, was intended as a primer on the Soviet threat to the U.S. defense industry. Topics included how the Soviets recruit U.S. agents, why defense contractors should keep records of employee travel and contacts with foreign nationals, and the importance of reminding workers with defense clearances of the proper handling of classified material.

An FBI expert told the 150 executives, meeting at Texas Instruments' offices in Dallas, that the current Soviet approach is subtle. A "friend of a friend" slowly will acquaint himself with the target, getting to know the person and his or her financial situation. Then, playing upon that friendship and promising tens of thousands of dollars of financial help, the agent will solicit sensitive information.

This scenario—based on spy cases on the West Coast—reflects a growing FBI and Pentagon concern that some of the most closely guarded U.S. defense secrets are being peddled to the Soviets.

Defense contractors are understandably reluctant to discuss either security problems or their programs to protect against breaches. "The key thing about security is that it is secret," said TI spokesman Norman Neureiter, summing up the attitude of several Texas companies. □

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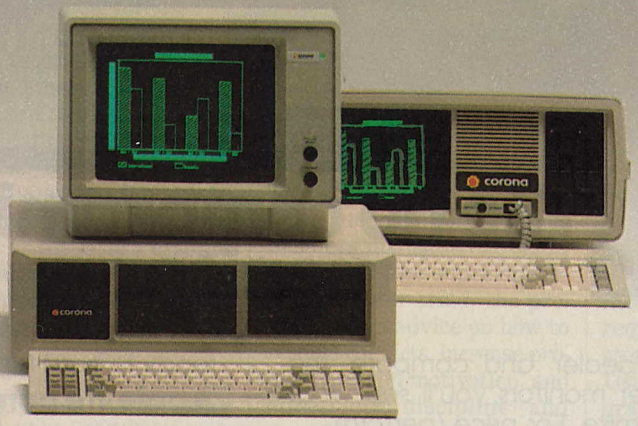

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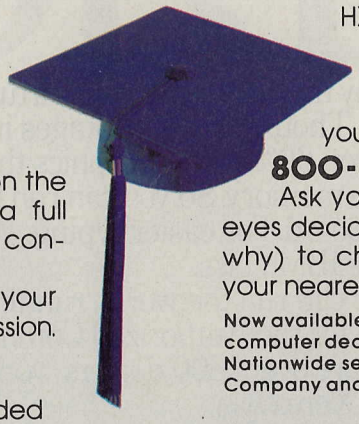

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Business

Accounting Pearl, a complete accounting system for small- to medium-sized businesses, includes accounts receivable and payable, payroll, and inventory modules. The system interfaces to the Personal Pearl database and can be customized to its user's specific needs. For the **IBM Personal Computer;** $895. Pearlsoft, Division of Relational Systems International, 25195 SW Parkway, POB 638, Wilsonville, OR 97070.

Ag Disk Farm Accounting Package is a full accounting system for farm and ranch operators. The package offers six preselected account lists—general farm, cash crop, cash crop with cattle, cash crop with swine, and ranch and family accounts. Each account list can be modified to meet individual needs. The system also prints five different reports. For the **Radio Shack TRS-80 Models III** and **4;** $499.95. Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102.

BESY, a bid estimation system for general contractors, includes a spreadsheet that can manage up to 1250 items of work with a total cost of $99 million, an overhead page that can be custom designed for each customer with up to 30 items of general conditions, and a subcontract worksheet. The program prints bid estimates and a variety of reports. For the **Apple IIe** with 64K bytes of user memory, an 80-column card, and two disk drives; $995. J & L Bidware, 1318 Kolterman Drive No. 3, Seward, NE 68434.

The Bookkeeper, a general-purpose accounting system for small- to medium-sized businesses, is an integrated module combining accounts payable and general ledgers. The program can be customized to reflect a business's individual chart of accounts. The Bookkeeper includes check-writing and report-generation capabilities and a training disk. For the **IBM Personal Computer** (with two disk drives) and the **XT;** $495. Privet Inc., POB 81, Middleton, WI 53562.

ESP, a forecasting and planning tool, integrates full-functioned econometric and statistical analysis with graphics and data management. Designed for ease of use, the program includes an on-line tutorial and help and command menus. You can collect, store, and display historical data, compute statistics, and apply regression techniques to formulate models and generate forecasts. For the **IBM Personal Computer** and compatibles; $795. Alpha Software Corp., 30 B St., Burlington, MA 01803.

Flying Club Accounting System helps flying club treasurers manage expenses, income, and assets. The program handles up to 150 club members, 25 accounts per member, 50 general ledger accounts, and other miscellaneous data. Prints bills and summaries. For the **Radio Shack TRS-80 Models I, III,** and **4;** $200. Practical Programs, 1104 Aspen Dr., Toms River, NJ 08753.

IRA Money Maker is designed to help you manage your Individual Retirement Account more advantageously. The program identifies appropriate investment vehicles, tells when to buy and sell, and directs you to information resources. Colorful graphics, sound, and text help to present IRA investment returns and business cycle scenarios. For the **IBM Personal Computer** with a double-sided disk drive and 320K bytes of memory; $29.95. Knowledge Reach Associates Inc., POB 3407, New York, NY 10185.

The Management Edge helps users improve their business management skills. Tailored to the superior/subordinate/peer triad, the program offers advice on how to resolve conflicts, increase productivity and motivation, and effectively discipline and reward employees. For the **IBM Personal Computer;** $250. Human Edge Software Corp., 2445 Faber Place, Palo Alto, CA 94303.

Management System 64 is an accounts receivable and inventory system for small- to medium-sized businesses. The program records sales transactions, tracks inventory, and prints invoices and packing slips. It also generates sales reports, customer lists, and mailing labels. For the **Commodore 64;** $79.95, disk. Entech Software, POB 881, Sun Valley, CA 91353.

Megafinder, a database manager, offers four simultaneous sorting orders, up to 20 suborders, a report generator, and on-line help screens. You design your own form layouts with the system's screen editor. The package also includes a variety of ready-made forms. For the **Apple II** and **IIe;** $149.95. Megahaus Corp., 5703 Oberlin Dr., San Diego, CA 92121.

Software Resources estimates software development project schedules and other resources. The program helps managers estimate staffing requirements, costs, milestones, and schedule lengths. Using your input, the program determines the most practical scheduling of design efforts, coding, development testing, and acceptance testing. For the **IBM Personal Computer;** $175. Associated Technology Co., Route 2, Box 448, Estill Springs, TN 37330.

Data Design

Described as an easy-to-learn and easy-to-use database management program, Data Design can swap data with Lotus 1-2-3, Wordstar, Visicalc, and other popular application packages. The system includes built-in help screens. For the ***IBM Personal Computer;*** *$249. Insoft, POB 608, Beaverton, OR 97075.*

New Software provides up-to-date listings of recent releases in microcomputer software. Descriptions are based on information supplied by the manufacturers and are not to be considered endorsements of the products. Companies continually offer new versions of popular programs for different machines. Please check with the manufacturer or a dealer to find out if a program is available for your computer. For in-depth evaluations of some of these programs, see our Software Review section.

Games

In the Hall of the Mountain King is an adventure game in which you must rescue the kidnapped Anitra from the Troll King. This involves making your way through the Norwegian Circle Maze, battling trolls, recovering treasures, and planting a bomb. For the **Radio Shack Model I, III,** and 4; $14.95. Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102.

Starfire is an action game in which you assume control of a spaceship. Playing against the computer, you determine the position of the enemy and maneuver your ship to destroy him before he destroys you and your base. The control panel gives you a constant update on fuel and time remaining. Joystick controlled. For **Atari** computers and the **Commodore 64;** $40, disk and cassette. Epyx Inc., 1043 Kiel Court, Sunnyvale, CA 94089.

Super Cipher challenges you to duplicate computer- or opponent-generated code. As you enter each guess, the computer displays a clue. You select code length, type of code, number of guesses, and time limit. For one or two players. For the **Commodore 64** and **VIC-20;** $12.95, cassette; $14.95, disk. Soft Cellars Inc., Suite 535, 828 Rue Royal, New Orleans, LA 70116.

Treasure Quest, an adventure game, has you traipsing through swamps, mountains, and forests in search of hidden treasure. But it's not quite as easy as it sounds; wild animals are lurking everywhere. For the **TI 99/4A;** $9.95, cassette; $11.95, disk. Software Resource Center, POB 193, Weston, MA 02193.

Wild Woods is an arcade-type game set in a deep forest. You must use your flamethrower to forge a path through the thicket in search of buried treasure and hidden gold. Along the way you have to avoid the rushing river, incoming tide, and search plane. For the **TI 99/4A;** $11.95, cassette. JW Software, 814 West Main St., Urbana, IL 61801.

Sorcerer

The second release in Infocom's Enchanter text adventure series finds you occupying a seat on the Circle of Enchanters. As a full-fledged member, you must rescue the kingdom and locate your vanished mentor, Belboz the Necromancer. For the ***Apple II, Atari, Commodore 64, IBM Personal Computer*** *and* ***PCjr,*** *and other popular computers; $49.95. Infocom Inc., 55 Wheeler St., Cambridge, MA 02138.*

Graphics

Colography, a full-screen color-graphics editor, lets you create and save a wide variety of images. The program generates arcs, circles, rectangles, ellipses, lines, and color or text. Images can be rotated, flipped, shrunk, enlarged, duplicated, or moved. Completed graphics can be used in programming, business, home, or technical applications. For the **IBM Personal Computer** and **XT;** requires color-graphics adapter card and color monitor; $99.95. Cactus Software Inc., POB 880, Peoria, AZ 85345.

Dotwriter Lettersets is a series of 16 disks that provide the Dotwriter graphics and text formatter with 120 different type fonts. Any two character sets can be intermixed on a print line, and an unlimited number of sets can appear on any page. Each disk contains between 3 and 10 letter sets. Compatible with C. Itoh, Epson, Okidata Microline, and Radio Shack DMP-series printers. For the **Radio Shack TRS-80 Models I** and **III;** $17.95 to $24.95, each. Prosoft, POB 839, North Hollywood, CA 91603.

Doublestuff is a graphics editor that lets you create designs in double-high-resolution graphics. Includes 16 colors. For the **Apple IIe;** $39.95. Doublestuff Software Development, 2053 West 11th St., Brooklyn, NY 11223.

Electroboard 2.0, a graphics and screen animation system, is suitable for business presentations and educational slide shows. Graphics can be interspersed with text to provide completely interactive visual presentations. Compatible with the Koala Pad Touch Tablet. For the **Apple II** and **IIe;** $200. Monument Computer Service, Village Data Center, POB 603, Joshua Tree, CA 92252.

Graphics Hardcopy generates screen printouts on Epson, Okidata, Gemini, NEC, Centronics, Trendcom, and IDS Paper Tiger printers. Its features include an automatic gray scale simulation and adjustable horizontal and vertical dimensions. For **Atari** computers; $34.95, disk; requires optional printer interface cable ($79.95) or Atari 850 interface module. Macrotronics Inc., Suite G, 1125 North Golden State Blvd., Turlock, CA 95380.

Infograph 100, a menu-driven presentation graphics package, allows you to create graphs by following a series of on-screen prompts. The program accepts data from most popular electronic spreadsheet packages. For the **DEC Rainbow 100** and **100+;** $395. GMS Software, 113 East Savarona Way, Carson, CA 90746.

Jr-Draw lets you create a variety of diagrams, charts, schematics, and drawings using two design libraries and multiple text fonts. The program supports an optional light pen. For the **IBM PCjr;** $195, disk; requires 128K bytes of memory. Micrografx, Suite 703, 1701 North Greenville, Richardson, TX 75081.

Plot 88 lets you generate plotter-like images on an IBM PC video display, IBM or Epson dot-matrix printer, or Tektronix 4025 graphics terminal. The program, which runs under Microsoft FORTRAN, allows you to construct charts, graphs, and contour maps up to 50 square feet in size. For the **IBM Personal Computer** and **XT;** $250. Plotworks, POB 12385, La Jolla, CA 92037.

Transition, a graphics presentation system, lets you create self-running or manually operated slide shows. Supporting up to eight disk drives and picture packing, the program can show hundreds of pictures in one continuous slide show. Transition is compatible with other Penguin utilities and can be used with pictures created with other graphics programs. For the **Apple II** and **IIe;** $49.95. Penguin Software, 830 4th Ave., POB 311, Geneva, IL 60134.

Education

Ambulance 10-33 helps emergency medical technician students prepare for certification and licensing exams. Multiple-choice and true-false questions test students'

knowledge of cardiopulmonary resuscitation, airway management, shock, trauma, and other subjects. The program uses realistic patient scenarios and simulated "pager call" and "radio traffic" messages. For the **Apple II;** $30. William J. Dyche, Ph.D., EMT-1, University of Osteopathic Medicine and Health Sciences, 3440 Grand Ave., Des Moines, IA 50312.

The Basics of BASIC acquaints beginning programmers with the computer keyboard and the fundamentals of BASIC in a 12-lesson series. Although designed to be used without constant reference to the documentation, the package includes a manual that reviews each lesson, provides additional information about the subject covered in the hands-on lesson, and presents review questions and practice problems. For the **Apple IIe** and the **IBM Personal Computer,** $99. Focus Media Inc., 839 Stewart Ave., Garden City, NY 11530.

Don't Shoot That Word is a learning game that teaches reading skills to children ages 6 and up. Players are in a shooting gallery where words are targets. The object is to shoot every word except the one matching an object that is pictured on the lower half of the screen. For **Atari** computers; $29.95, cassette or disk; joystick required. Hayden Software Co., 600 Suffolk St., Lowell, MA 01853.

Factor Blast helps children ages 10 and up master factoring concepts. On a grid of 25, 64, or 100 numbers, players alternately select numbers for an opponent to factor. Selections are made by blasting numbers from the screen. The opponent must then blast the factors of the number selected. For the **Apple II** and **IIe, Atari 400** and **800,** and **Commodore 64;** $29.95, disk (Commodore 64 version also on cassette). Hayden Software Co., 600 Suffolk St., Lowell, MA 01853.

Managerial Finance in Action teaches managers and executives the basics of financial management. Modules include quizzes, computer-based exercises, short lectures, computer-assisted interactive instruction, and a business simulation. For the **IBM Personal Computer** and compatibles and the **Apple II;** $450; requires color-graphics adapter card. International Management Institute Inc., 34 Maple St., Summit, NJ 07901.

Musicland is a set of four integrated games aimed at musically untrained children. Sound Factory lets children design their own sounds; Timbre Painting lets them paint their songs with tone colors; Music Doodles is designed for drawing songs with an electric crayon; and Music Blocks lets youngsters use their own doodles as music blocks for constructing whole songs. The main instruction/student manual is complemented by a teacher's manual and Musicland activity cards. For the **Apple II** with 64K bytes of user memory; requires the Mountain Computer Music-system; $150. Syntauri Corp., 4962 El Camino Real, Los Altos, CA 94022.

Professor Pixel is an interactive tutorial that helps IBM PC users learn how to incorporate their machine's graphics, sound, and animation capabilities into their own BASIC programs. For the **IBM Personal Computer, XT,** and **PCjr;** $59.95. Individual Software Inc., 1163-I Chess Dr., Foster City, CA 94404.

Run for the Money uses arcade-game action to teach fundamental business skills. Players must repair their stranded spaceship by raising funds, developing business

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plans, purchasing parts, bidding for materials, and so on. For the **IBM Personal Computer, Apple II, Commodore 64,** and **Atari** computers; $49.95. Scarborough Systems Inc., 25 North Broadway, Tarrytown, NY 10591.

Versa-Prof Gradebook System works with the popular Visicalc electronic spreadsheet program, enabling educators to average student grades according to their own specific grading systems. It also prints gradebook records, roll and grade sheets, and progress letters. For the **Apple II;** $75. Rocking X Software Co., 1207 West Lee St., Borger, TX 79007.

Technical Tools

Amperware is a programming tool that enhances Applesoft BASIC. Seventeen new commands improve keyboard input performance, disk operations, searching and sorting times, and formatted printing. For the **Apple II** and **IIe;** $49.95. Scientific Software Products Inc., 3171 Donald Ave., Indianapolis, IN 46224.

DoubleDOS is an operating system enhancer that enables its host computer to run two programs simultaneously. The system works by dividing the computer's memory into two segments. You control which program's output appears on the video display. For the **IBM Personal Computer** and **XT** running DOS 1.1 or 2.0; $299. Softlogic Solutions, 530 Chestnut St., Manchester, NH 03101.

Fantasy Character Generator lets you quickly generate a wide variety of game characters. Features include 9 character classes, 8 character races, 13 primary characteristics, and 9 magical specialty categories. For the **VIC-20;** $8.95; requires 8K- or 16K-byte memory expander. Reilly Associates, POB 17144, Rochester, NY 14617.

File Base 3 simplifies text-file management through the use of simple file headers and unstructured keyword entry and retrieval. "Fuzzy search criteria" permit text retrieval with general or vague queries. Conditional expressions (AND, OR, and NOT) and a multistage retrieval can be used to extend or limit searches. For the **IBM Personal Computer, XT,** and compatibles; $395. Data Technology Corp., 2775 Northwestern Pkwy., Santa Clara, CA 95051.

File Driver is a collection of operating system utilities. Included are routines that allow multiple wild cards on a command line, exclude file lists from a wild-card designation, and write to and read from text files. The system also allows you to create your own application-specific utilities. For **CP/M-, MP/M-,** and **TurboDOS-based** systems; $90 (5¼-inch disk), $85 (8-inch disk). Dunbar-Ridge Corp., 102 Sterling Court, Syosset, NY 11791.

HF Tools for the BASIC User provides IBM PC owners with 22 function routines. The system, which communicates with BASIC through a call interface, lets users determine their system's configuration, generate printer screen dumps, create a unique graphics character set, display scrolling or clearing windows, and more. For the **IBM Personal Computer** and compatibles; $100. HF Computing Services Inc., 224 Old Orchard Grove, Toronto, M5M 2E5 Canada.

P-Comm is a smart communications package aimed at UCSD p-System users. The package operates as a terminal at speeds of up to 1200 bits per second (bps). It can also accomplish XMODEM file reception and transmission at rates of 2400 and 9600 bps, respectively. Other features include a phone directory, a wide variety of file transfer protocols, and function key and graphics character set support. For the **IBM Personal Computer** and **XT;** $95. Ergosoft, 7122 Cather Court, San Diego, CA 92122.

Quick Copyer can copy a single-sided **TI 99/4A** disk in three passes or fewer; a double-sided disk can be copied in six passes or fewer. The program requires 32K bytes of user memory and either Extended BASIC, the Mini Memory, or the Editor-Assembler module; $39.95. Quality 99 Software, 1884 Columbia Rd. #500, Washington, DC 20009.

Superterm is a telecommunications program that features an 18K-byte text editor, auto-dial/auto-answer capabilities, a 40-, 80-, or 132-column display, and a variety of uploading and downloading formats. Superterm can mimic a number of expensive terminals, a feature that lets you communicate with mainframes. For the **Commodore 64** and **VIC-20** with modem; $149.95, disk. Midwest Micro Inc., 311 West 72nd St., Kansas City, MO 64114.

Textform, a CP/M text formatter, recognizes over 30 text-imbedded commands. The program controls page and line lengths, margins, line spacing, underlining, headnotes and footnotes, and text centering and justification. It also includes a number of print mode commands for Epson printers. For the **Heath/Zenith H-89;** $49.95. Gibson Software, Route 1, Box 317, Iron Station, NC 28080.

Windowmaster, a windowing system, lets you open, close, expand, reduce, or move windows on screen to perform a number of tasks simultaneously. This program can merge Lotus's 1-2-3, Visicalc, Wordstar, and most other popular business computer software into an integrated multitasking workstation. For the **IBM Personal Computer, XT,** and compatibles and **MS-DOS-based** systems; $295. Structured Systems Group Inc., 5204 Claremont Ave., Oakland, CA 94618.

Word Processing

B.Writer (French version) is a French-based word processor. Features include block moves and deletes, word wrap, automatic right-margin justification, a help screen, automatic line centering, and a wide array of print options. For the **IBM Personal Computer** and compatibles; $39. Automated Information Systems, Suite 203, 1503 Avenue J, Lubbock, TX 79401.

Megaspell spots misspelled words in documents created by the Megawriter word pro-

ZyIndex

*This data search and retrieval system can find selected information in any ASCII-based file. You retrieve text by specifying words or phrases. OR, AND, WITHIN, and AND NOT "connectors" govern in what context the information is to be retrieved. For the **IBM Personal Computer, XT** and compatibles; $295. Zylab Corp., 233 East Erie St., Chicago, IL 60611.*

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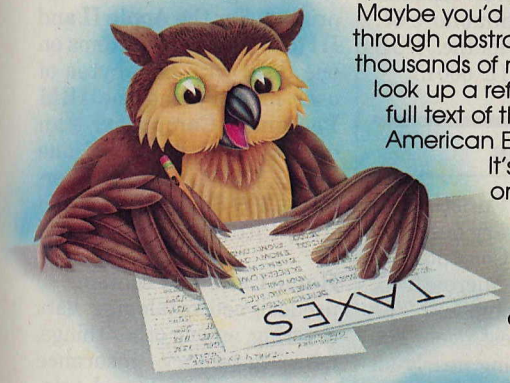

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cessor. Comes with a 40,000-word dictionary that can accept 10,000 additional user-supplied words. It can correct multiple occurrences of a misspelled word with a single keystroke. For the **IBM Personal Computer;** $99.95. Megahaus Corp., 5703 Oberlin Dr., San Diego, CA 92121.

Personal Bibliographic System is a word processor and database system that compiles and maintains formatted bibliographies. Its features include alphabetic or defined arrangement of citations, variable-length fields and records, and a complete text formatter and screen editor. An optional data-transfer system automatically downloads citations from on-line library catalogs. For the **Apple II, IIe,** and **III, IBM Personal Computer, Terak,** and **Victor 9000;** $250 (data-transfer system, $200). Personal Bibliographic Software, POB 4250, Ann Arbor, MI 48106.

Simply Perfect offers the Letter Perfect word processor, Spell Perfect spelling checker, and Data Perfect database on a single disk. The three programs share data and use common commands. The program can read Visicalc text files. For the **Apple IIe;** $189.95; requires extended 80-column card. LJK Inc., 7852 Big Bend Blvd., St. Louis, MO 63119.

The Speller can check a 3000-word document in less than a minute. It has a 20,000-plus word dictionary, and you can create your own dictionary. The program can be configured to check files created by Pie Writer, Wordstar, Volkswriter, the Final word, and Easywriter's ASCII files; or it can be generically configured to check any standard or near-standard MS-DOS text file. For the **IBM Personal Computer** and compatibles; $49.95. Hayden Software, 600 Suffolk St., Lowell, MA 01853.

Thor is a combination word processor and database manager that can help you organize ideas. The program gives you a sizable workspace in which you can record ideas in units as short as a single sentence or as long as multiple pages of text. Using its database capabilities, Thor can then organize your ideas in a variety of ways and combine them to form a complete document. For the **IBM Personal Computer, XT,** and compatibles; $295. Fastware Inc., 200 Freeway Drive East, East Orange, NJ 07018.

Word Writer is a stand-alone full-featured word-processing program that can also be used in conjunction with Timeworks' Data Manager and Data Manager 2. Running with the database program, Word Writer can maintain and print name and address lists, produce customized reports up to 20 columns wide, individually address and print form letters, print name and address files onto standard mailing labels, and calculate numerical data from one column to the next, giving it spreadsheet capabilities. For the **Commodore 64,** $59.95. Timeworks Inc., POB 321, Deerfield, IL 60015.

Write Now

With a built-in 80-column display, this word processor for the ***Commodore 64*** *supports full-screen editing, search and replace, and block move and delete in addition to standard word-processing functions. Works with any printer and interfaces with Cardco's Spell Now, Graph Now, and Mail Now; $49.95. Cardco Inc., 313 Mathewson, Wichita, KS 67214.*

Languages

The Greenleaf Functions is a C function library designed for use with the Computer Innovations C86, Microsoft C, and Lattice C compilers. The system provides over 200 routines, including nearly all DOS and BIOS capabilities, string handling, color text, window scrolling, and graphics printing. For the **IBM Personal Computer** and **XT;** $175. Greenleaf Software, 2101 Hickory Dr., Carrollton, TX 75006.

Tiny Logo is an implementation of the popular educational language for the **TI 99/4A.** Like the bigger versions, Tiny Logo uses turtle graphics to teach the principles of programming and computer literacy to newcomers. Requires the 16K-byte memory expansion pack; $19.95, cassette. Micro Computers Software, 34 Maple Ave., Armonk, NY 10504.

Home

CARS helps you keep track of maintenance and repair information while monitoring the cost of owning your automobile. By tracking mileage and gas consumption statistics, this program helps you determine when your car needs a tune-up or any of a number of general repairs. It can produce graphs and printed reports. For the **VIC-20** and **Commodore 64,** $24.50, cassette; $27.50, disk. New Leaf Inc., 120 Lynnhaven, Belleville, IL 62223.

Catman is a mini-file system that's designed to help you organize your books, tapes, records, or any other type of collection. To set up the database, you follow program prompts. You can add and delete items after you've established the catalog. The search option locates items for viewing on-screen or to be printed. For the **Apple II** and **III** (can catalog 2000 items on one disk) with 64K bytes of user memory and the **IBM Personal Computer** (can catalog 5000 items on one disk); $19.95. Zephyr Services, 306 South Homewood Ave., Pittsburgh, PA 15208.

Home Cataloger contains 10 predesigned cataloging lists covering, among other things, home inventory, insurance policies, and book and telephone lists. You can also create customized catalogs. The program can total numbers in any or all numeric categories, and it can generate complete lists, lists of selected categories in any order, and custom printouts. For the **Apple II** and **IIe, Commodore 64,** and **IBM PCjr;** $49.95. Continental Software, 11223 South Hindry Ave., Los Angeles, CA 90045.

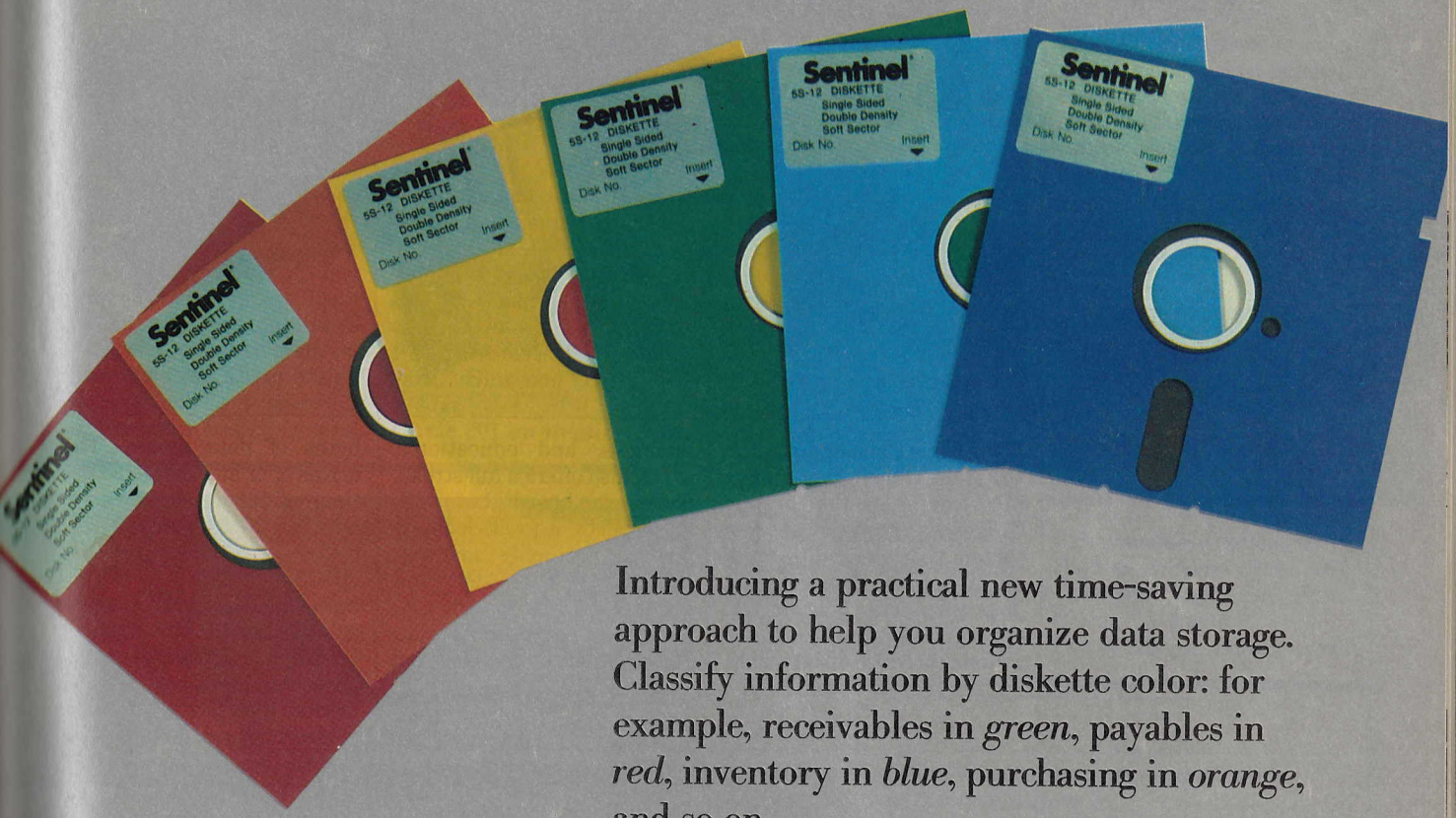
Moneymaker, a financial planning program that runs with Visicalc, helps you set personal, realistic goals that take into account past debts, present needs, and future plans. The program covers retirement plans, life insurance, and debt consolidation. For **Apples** running DOS 3.3 and the **IBM Personal Computer;** requires 64K bytes of RAM; $139. Money Tree Software, 760 SW Madison Ave., Corvallis, OR 97333.

VIC Relay lets you control burglar alarms, garage doors, door locks, electric radiators, lamps, air conditioners, and a host of other appliances and convenience items with your **Commodore 64** or **VIC-20;** $39.95. Handic Software Inc., Suite 7, 5090 Central Hwy., Pennsauken, NJ 08110. □

Circle 63 on inquiry card. →

New.

Sentinel Color Diskettes.



Introducing a practical new time-saving approach to help you organize data storage. Classify information by diskette color: for example, receivables in *green*, payables in *red*, inventory in *blue*, purchasing in *orange*, and so on...

Each Sentinel Color Diskette has a lifetime guarantee; 100% certified at levels which meet or exceed all criteria necessary for accurate, error-free read/write operations.

Phone toll-free for the name of the dealer nearest you:
1-800-323-5005 (in Massachusetts 1-800-323-5001).

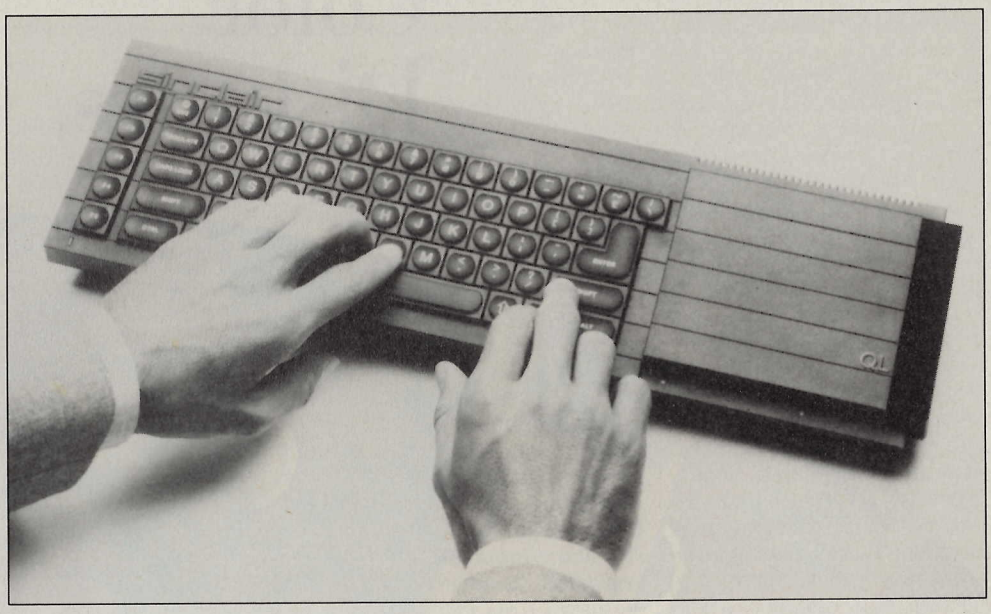
Sentinel

TECHNOLOGIES

One Sentinel Plaza, Hyannis, MA 02601.

A Quantum Leap

The Sinclair QL computer



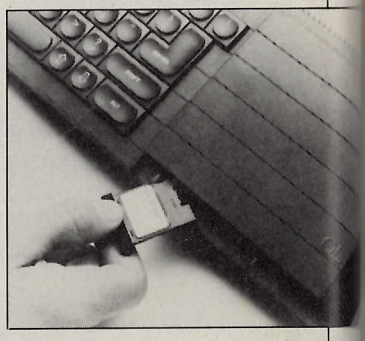
Sir Clive Sinclair, inventor of the world's first under-$100 computer—the Sinclair ZX80—has introduced another system that's bound to wake up at least a few industry observers. The Sinclair QL (for "quantum leap") includes a Motorola 68008 32-bit microprocessor, 128K bytes of random-access memory (expandable to 640K bytes), and two internal mass-storage drives—all for $499.

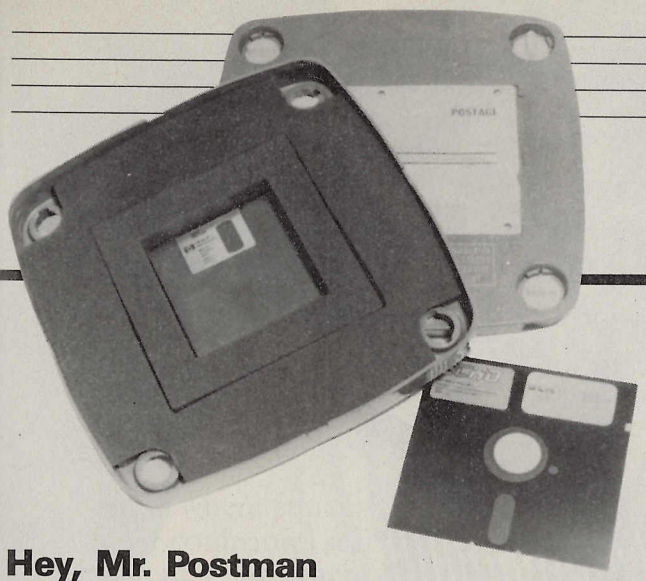
The computer, which is being marketed toward home, business, and educational users, also offers a full-stroke, 65-key keyboard, two RS-232C ports, a joystick interface, a read-only memory (ROM) cartridge slot, and produces a 512- by 256-dot, 8-color, high-resolution display. The system is shipped with integrated word processing, database, electronic spreadsheet, and graphics programs, as well as BASIC.

The QL's two mass-storage units employ thumb-sized cartridges that hold up to 100K bytes of data apiece. The drives offer an average access time of 3.5 seconds and a data-transfer speed of 15K bytes per second. The QL's QDOS operating system generates multi-window displays and permits multiple-tasking operations. Optional equipment includes a parallel printer interface with multichannel sound generator, a modem, a hard-disk interface, a terminal emulator, a Pascal compiler, and a 68000 assembler.

Additional information is available from Sinclair Research Ltd. USA, 50 Staniford St., Boston, MA 02114. **Circle 200 on inquiry card.**

The QL 0.5Mb RAM pack (left) expands RAM to 640K. Cartridges (right) for the twin micro drives hold up to 100K bytes each.



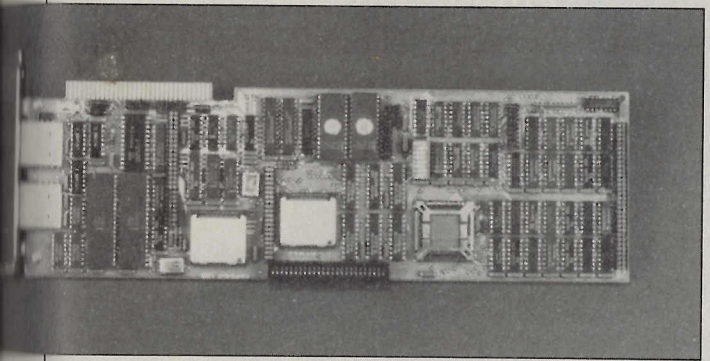


Hey, Mr. Postman

Data Vault's floppy-disk mailer

Data Vault has unveiled its DVI-FD-25, a floppy-disk mailer that holds up to ten 3½- or 5¼-inch disks. The case is constructed from rugged polyethylene and is lined with protective shock-absorbing foam. Other design features include a patented, positive-action locking system, a permanent address-card holder, and a built-in carrying handle. The mailer comes in standard beige and sells for $20. For additional details, contact Data Vault Division, PRC of America, 475 Boulevard, Elmwood Park, NJ 07407.

Circle 201 on inquiry card.



Extending the XT

The XTender local-network circuit board

XTender ($3995) is a local network that links an IBM Personal Computer XT with up to five remote workstations. Consisting of a plug-in circuit board and disk, the system allows inexpensive terminals to share the XT's computing abilities.

The system features Intel 80186 and 80286 microprocessors, up to 1024K bytes of random-access memory (RAM), and a maximum data-transfer speed of 19.2K bits per second. XTender is compatible with the MP/M-86, Unix, and Xenix multiuser operating systems. The system works with all unmodified PC-DOS-based programs and uses standard RS-232C cables and connectors.

Complete details are available from PC Technologies Inc., Box 2090, 738 Airport Blvd., Ann Arbor, MI 48106.

Circle 204 on inquiry card.

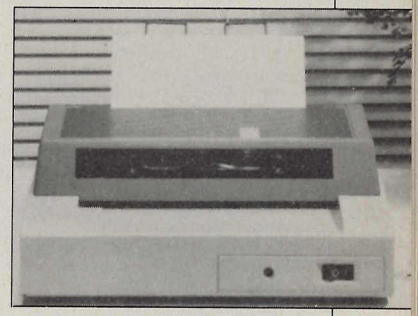
Versatile Thermal Printer

Fujitsu's TTP16 thermal printer prints near-letter-quality output on a wide variety of surfaces

Fujitsu America's TTP16 is a thermal-transfer printer that can produce near-letter quality output on a variety of media, including plain paper, vinyl surfaces, and overhead viewgraph sheets.

The unit's 16-dot print head offers a resolution of 1/120 by 1/120 inch per single pass. A precision-positioning feature assures perfect alignment and provides a print speed of 45 characters per second. Because the print head never strikes the printing surface and moving parts are driven by stepping motors, the printer generates a relatively low noise level of 50 decibels.

The TTP16 offers a variety of built-in character sets, including 96 ASCII characters. Other features include vertical and horizontal tabs, Centronics-compatible parallel and RS-232C interfaces, and paper-out and ribbon-end sensors. Ribbons are available in black, yellow, magenta, and cyan. Multiple-color documents can be created by overprinting. The unit is priced at $625.



For complete details, write Fujitsu America Inc., 3075 Oakmead Village Dr., Santa Clara, CA 95051.

Circle 202 on inquiry card.

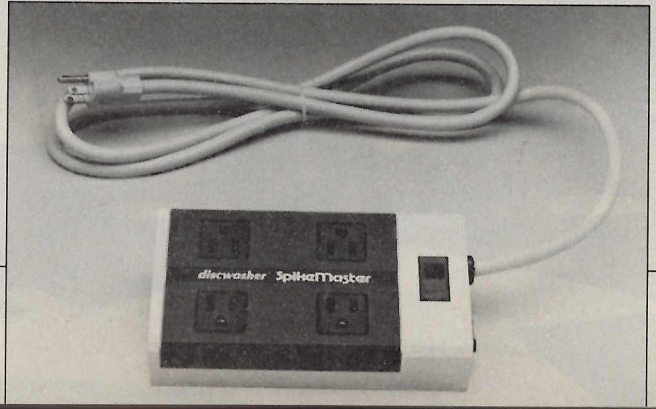
Spiking It

Spikemaster protects computer equipment and software against power surges

Discwasher's Spikemaster protects computer systems from harmful electrical power surges. The 15-ampere unit includes five active surge-suppression devices plus a five-part filter section. It also offers an on/off switch with indicator light, radio-frequency interference filtering, a circuit breaker, four widely spaced sockets, and a 6½-foot heavy-duty cord. Spikemaster lists for $79.95.

For additional details, contact Discwasher, POB 6021, Columbia, MO 65205.

Circle 203 on inquiry card.



Herbie Briggs has just destroyed the myth that all floppy discs are created equal.

They seem equal. Until you look at the seams.

That's where equality ends.

Most companies seal their discs with a spot here, a spot there. Leaving most of each seam not sealed at all.

Sooner or later, the seams might do what comes naturally: they bulge. Warp. Pucker. Open up.

Pens, pencils, fingernails—even a four-year-old's, like Herbie—can catch and snag in those wide open spaces.

That's sloppy. And dangerous. Because if you put a sloppy floppy into your disc drive, it can jam your drive. Ruin your drive head. Lose your data.

So much for their seams. Ours are different.

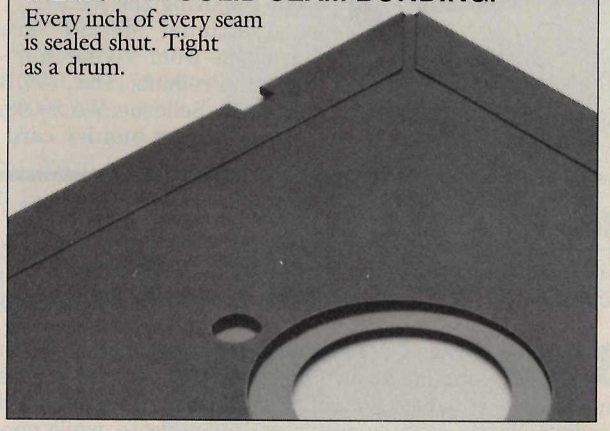
THE SLOPPY FLOPPY:
Sealed with a spot here, a spot there. Leaving unsealed seams everywhere.

Memorex uses a process we developed, called Solid-Seam Bonding.

Solid-Seam Bonding seals shut every inch of every seam of every Memorex® floppy disc. Tight as a drum. That makes the Memorex floppy stiffer. Stronger. And your data safer.

To resist bulging, warping, puckering, or opening up.

MEMOREX SOLID-SEAM BONDING:
Every inch of every seam is sealed shut. Tight as a drum.



To resist all the things that can jam your drive, ruin your drive head, or lose your data.

Which proves that a Memorex floppy disc isn't equal to all the others. It's better.

Solid-Seam Bonding is just one example of the extra care that goes into every Memorex floppy disc. Be it 8," 5¼" or the new 3½." Extra care that lets us guarantee every Memorex disc to be 100% error-free.

The next time you're buying a floppy disc—or a few hundred of them—just remember this:

It's always better to be safe than sloppy.

For more information on the full line of Memorex quality computer media products, including computer tape, call toll-free: 800-222-1150. In Alaska and Hawaii call collect: 408-987-2961.

Your Data. When it matters, make it Memorex.™

MEMOREX

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Circle 42 on inquiry card.

Feeding Time

The Vivitar low-cost cut-sheet feeder

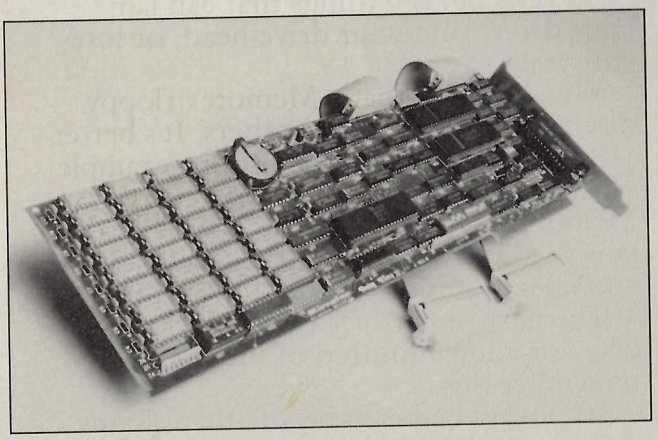
Vivitar Computer Products is offering cut-sheet feeders for Transtar, Silver-Reed, Morrow, NEC, Diablo, C. Itoh, and other popular printers. The units sell for $395 each and require only seconds to install. Features include a 200-sheet capacity, and 7- to 14-inch variable paper positioning. The units also offer a full-forms handling capability, allowing the printing of super- and subscripts and other special functions. Printer ribbons and print wheels can be changed and envelopes printed without removing the feeder.

Additional details are available from Vivitar Computer Products Inc., POB C-96975, Bellevue, WA 98009.
Circle 205 on inquiry card.

Blue II

A multifunction card with its own Z80 microprocessor for the IBM Personal Computer

Baby Blue II is an IBM Personal Computer multifunction card that contains its own Z80 8-bit microprocessor. The chip supports true background processing, enabling the card to independently compile, print, or communicate, while normal system operations continue unaffected.



The Z80 also allows the system to run CP/M-80 software directly under PC-DOS, eliminating the need to maintain separate operating systems.

Other card features include two serial ports, a Centronics-compatible parallel printer port, a clock/calendar with battery backup, and expansion capabilities of up to 256K bytes of random-access memory (RAM). A RAM-based disk emulator, printer spooler, and communications software are also included. Baby Blue II, with 64K bytes of RAM, sells for $395.

Complete details are available from Microlog Inc., 222 Route 59, Suffern, NY 10901.
Circle 208 on inquiry card.

Cassette Interface

Cassette Interface and Duplicator for the Commodore 64 and VIC-20

Omnitronix's Cassette Interface and Duplicator lets Commodore 64 and VIC-20 users load and save programs to any ordinary portable cassette recorder.

Priced at $34.95, the unit offers a recorder-motor control, a polarity switch, and an audio-monitor output. Tapes made with the unit can be run on the Commodore Datasette recorder and vice versa. Connecting two recorders to the unit permits the creation of high-quality program backups.

Further information is available from Omnitronix, POB 12309, Seattle, WA 98111.
Circle 206 on inquiry card.

A Junior Legacy

The Legacy expansion system for the PCjr

Looking to get more out of your PCjr? The Legacy expansion units provide IBM's PCjr with a variety of enhanced features.

Legacy I ($395) consists of a PCjr-matching cabinet, heavy-duty power supply (capable of handling a floppy- or hard-disk drive), four expansion slots, an 80-pin expansion bus, and a light-emitting diode system-status display. The unit enables users to expand the PCjr's random-access memory (RAM) to 512K bytes. Legacy II ($795) offers all of Legacy I's features, but also includes a half-height floppy-disk drive and disk controller. This unit allows a potential memory expansion to a maximum of 640K bytes.

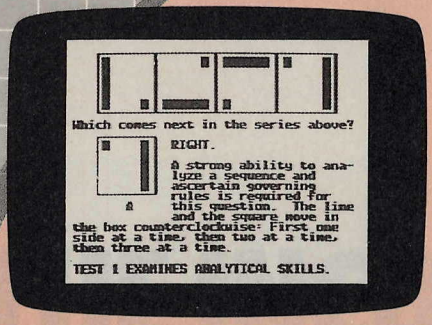
Additional details are available from Legacy Technologies Ltd., Suite 100, 1414 O St., Lincoln, NE 68508.
Circle 207 on inquiry card.

For the 21st Century Mind

Do you wish you could play with something as intelligent as your word processor?
Did you outgrow monsters years ago?
Is your home accounting program too dull to play?
Are spreadsheets not your idea of a good time?

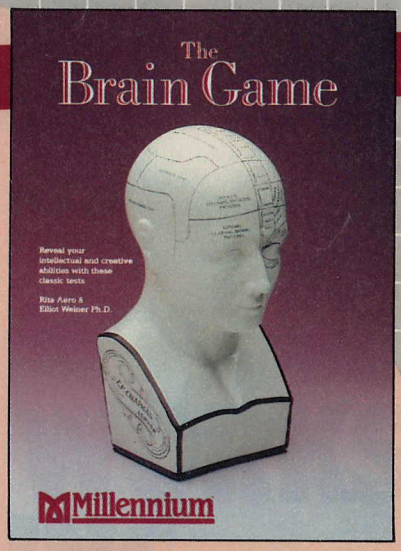
Introducing Millennium software. Literate. Engrossing. Enriching. And Playful.
It will stretch your mind all the way to the 21st century.

The Brain Game

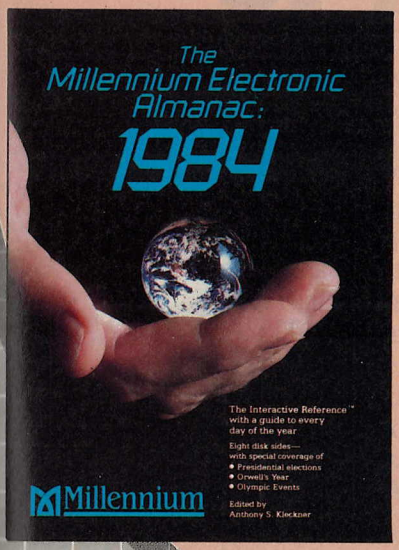


Test your right brain, your left brain, **your** hardware and software, and discover how you measure in intelligence and creativity. With these classic tests find out how smart your computer thinks you are...and get smarter while you do it.

Explained by Rita Aero and Elliot Weiner, Ph.D. $39.95.

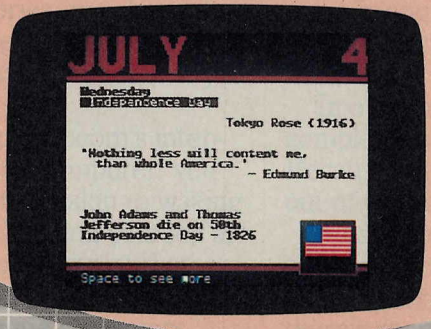


The Millennium Electronic Almanac™: 1984



Thousands of facts, figures, and upcoming events for 1984 flash on screen at your command with The Millennium Electronic Almanac. *Eight* disk sides include—

SeasonDisks,™ an interactive calendar offering every day:
Historical events
Famous birthdays
Notable quotes
Brain-teasing trivia
Challenging new words



InfoDisks,™ an information bank including:
The 1984 Olympics
Presidential elections
Health and fitness
Space exploration
Orwell's year

Edited by Anthony S. Kleckner.
$49.95.

Millennium™

A New Age in Mind

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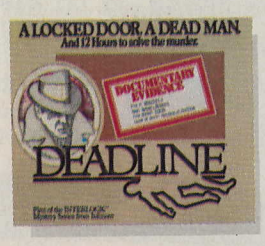
For the Apple IIe and II+. Coming soon for IBM. Copyright © 1984 Millennium Group Incorporated. Apple IIe and II+ are trademarks of Apple Computer, Inc. IBM is a trademark of International Business Machines.

Ask for these Millennium products at your local dealer.

Your greatest challenge lies ahead and downwards.
ZORK I
infocom

The next step downward is danger.
ZORK II
infocom

It all comes down to this.
ZORK III
infocom


A LOCKED DOOR, A DEAD MAN.
And 12 Hours to solve the murder.
DOCUMENTARY EVIDENCE
DEADLINE

INSIDE!
the WITNESS
SOMEBODY'S GOING TO TAKE THE DEEP SIX!

STARCROSS
infocom

THE INCOMPLETE WORKS OF INFOCOM, INC.

Incomplete, yes. But it's not just because we're always bringing out new stories in the Infocom interactive fiction collection. Nor is it simply due to the fact that with all the writing and re-writing, honing and perfecting that we put into every one of our stories, our work is seemingly never done.

The real reason is: an Infocom work of fiction can never be complete until you become a part of it.

You see, as hard as we work at perfecting our stories, we always leave out one essential element—the main character. And that's where you enter in.

Once you've got Infocom's interactive fiction in your computer, you experience something akin to waking up inside a novel. You find yourself at the center of an exciting plot that continually challenges you with surprising twists, unique characters (many of whom possess extraordinarily developed personalities), and original, logical, often hilarious puzzles. Communication is carried on in the same way as it is in a novel—in prose. And interaction is easy—you type in full English sentences.

But there is this key difference between our tales and conventional novels: Infocom's interactive fiction is active, not passive. The course of events is shaped by the actions you choose to take. And you enjoy enormous freedom in your choice of actions—you have hundreds, even thousands of alternatives at every step. In fact, an Infocom interactive story is roughly the length of a short novel in content, but because you're actively engaged in the plot, your adventure can last for weeks and months.

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Find out what it's like to get inside a story. Get one from Infocom. Because with Infocom's interactive fiction, there's room for you on every disk.

INFOCOM™

Infocom, Inc., 55 Wheeler Street, Cambridge, MA 02138

For your: Apple II, Atari, Commodore 64, CP/M8", DECmate, DEC Rainbow, DEC RT-11, IBM PC* and PCjr, KAYPRO II, MS-DOS 2.0*, NEC APC, NEC PC-8000, Osborne, Tandy 2000, TI Professional, TI 99/4A, TRS-80 Models I and III.

*Use the IBM PC version for your Compaq, and the MS-DOS 2.0 version for your Wang or Mindset.

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Our competition's 43% price reduction says a lot about Terrapin™ Logo.

About a year ago, Terrapin Logo, the Unofficial Apple® Logo, became a big, big seller. That's because people like you realized that for performance and price you really couldn't do any better.

Recently, the Official Apple Logo lowered its price by 43%. That should tell you something about their product. And it should tell you something about ours.

	Terrapin Logo	Official Logo
Saving Pictures on Disk	Yes	No
Word & List Tutorial	Yes	No
Word & List Commands	Yes	Yes
User-Defined Error Handling	No	Yes
Program Tracing Capability	Yes	No
Workspace	Larger	Smaller
Suggested Retail Price	$99.95	$99.95

Now, Terrapin Logo and the Official Apple Logo cost the same. But the similarity ends there.

Check the chart for yourself. When all is said and done, it's easy to see why Terrapin Logo, the Unofficial Apple Logo, is still better than the official one.

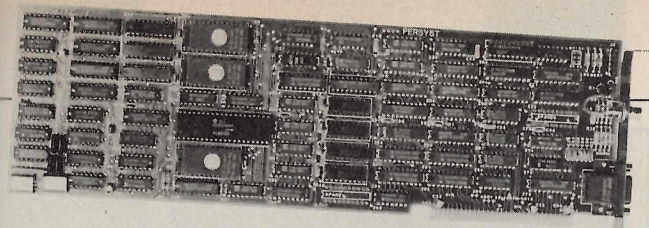
Ask for Terrapin Logo at software dealers everywhere. Or call us directly for further information.

Terrapin™
The Logo People

Terrapin, Inc., 222 Third Street, Cambridge, MA 02142 (617) 492-8816

Terrapin Logo runs on the Apple II, II +, IIe and Franklin computers, and requires 64K RAM.
Franklin is a trademark of Franklin Computer Corporation. Apple is a registered trademark of Apple Computer, Inc.

Circle 73 on inquiry card.



Best of Both

The BoB display adapter board for the IBM Personal Computer and PC XT

The BoB Display Adapter is a plug-in card that provides the IBM Personal Computer and PC XT with both color- and monochrome-display outputs.

Priced at $425, the adapter interfaces with a variety of high-resolution monitors. It offers a 320- by 200-dot medium-resolution display with four colors and a high-resolution 640- by 200-dot monochrome mode.

Optional 320- by 400-dot and 640- by 400-dot outputs are also available.

When in the text mode, the board displays 8- by 12-dot characters within a 10- by 16-dot grid. BoB supports reverse-video, blinking-, blanked-, and intensified-character modes. Other features include a lightpen interface.

Complete information is available from Personal Systems Technology Inc., Suite A, 15801 Rockfield Blvd., Irvine, CA 92714.
Circle 209 on inquiry card.

Optical Allusion

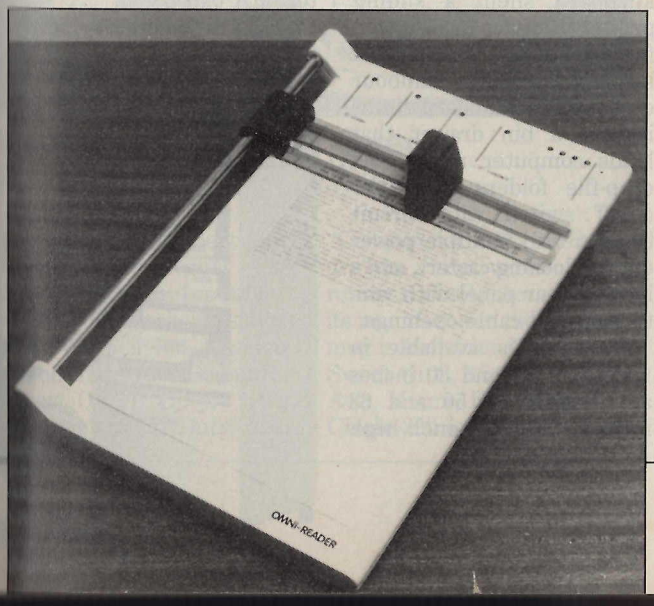
Omni-Reader—an optical character reader that eliminates retyping documents into your computer

Tired of using a keyboard to copy documents into your computer? Omni-Reader lets you transfer data with a wave of your hand.

The unit, which connects to Apple, IBM, Hewlett-Packard, and many other computers, uses a movable light-sensitive linear array to scan text lines. Users guide the array along a built-in ruler that incorporates a special grating system. As the array scans the text, the grating divides each line into a series of discrete signals. A dedicated microprocessor using specially developed algorithms interprets these signals and sends the decoded characters to its host computer.

The system is capable of recognizing most popular type fonts. Users can also "teach" the system to recognize non-standard fonts. Omni-Reader retails for $495.

More details are available from Oberon International, Suite 630, LB 48, 5525 MacArthur Blvd., Irving, TX 75062.
Circle 211 on inquiry card.



Printer of a Different Color

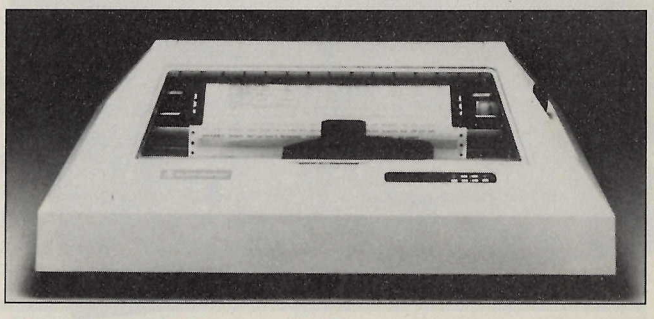
The DP-9725 Color/Scribe—an IBM-compatible multi-color printer

Anadex's DP-9725B Color/Scribe printer produces multiple-color text and graphics printouts. The IBM Personal Computer-compatible unit includes software that permits high-resolution screen dumps.

Priced at $1625, the printer employs a multiple-pass printing mechanism and a four-color ribbon cartridge. Various combinations of these colors enable the printer to generate a wide spectrum of hues. The printer can change colors at any point in a line.

Other features include a graphics resolution of 144 by 144 or 72 by 72 dots, seven character sets, and reverse and half-line feeds. The unit offers four printing modes—enhanced, correspondence, data-processing quality, and high-resolution graphics. Print speeds range from 60 to 240 characters per second, depending on the mode and number of colors used.

For additional details, contact Anadex Inc., 1001 Flynn Rd., Camarillo, CA 93010.
Circle 210 on inquiry card.



Two in One

Apple's Duodisk twin disk-drive system

Tired of those unsightly disk drives? Apple's Duodisk packs two half-height, 140K-byte drives into an attractive case that fits between computer and monitor.

Technical improvements in the new 5¼-inch system include a disk-eject feature and an advanced head-positioning mechanism that provides more precise reading of half tracks. The unit comes with a controller card that connects it to any Apple II Plus or IIe. It is operationally identical to the Disk II drive and runs all Apple II software.

Duodisk is priced at $795 (approximately $145 less than two Disk II units with controller). Complete details are available from Apple Computer, 10260 Bandley Dr., Cupertino, CA 95014.
Circle 212 on inquiry card.

From Across the Pond

Memotech's MTX-512 personal computer

Memotech Corp. has unveiled the MTX-512, an inexpensive English import that offers a wide array of built-in features.

The Z80A-based computer includes 80K bytes of random-access memory (expandable to 512K bytes), a 79-key full-stroke keyboard, a Centronics-compatible parallel port, two game ports, and separate TV- and video-monitor interfaces. Priced at $595, the system also features Oxford BASIC, a graphics resolution of 256 by 192 dots, 16 colors, sprites, a white noise generator, and three sound channels. Optional equipment includes a dual RS-232C interface, an 80-column board, 5¼- and 8-inch floppy-disk drives, a 5-megabyte hard-disk drive, and CP/M. The Oxford Ring, an optional local network, links together as many as eight MTX-512s.

Additional information is available from Memotech Corp., 7550 West Yale Ave., Denver, CO 80227.

Circle 213 on inquiry card.

More Memory for Your 64

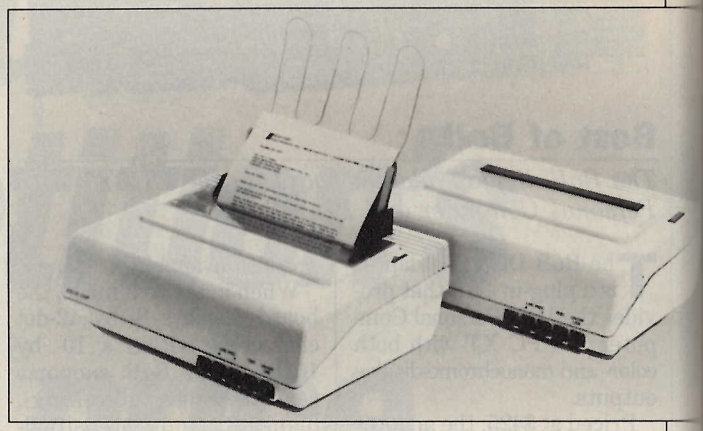
A memory-expansion card for the Commodore 64

Lindgren Associates has introduced RAM Disc 64, a memory-expansion card for the Commodore 64. The card offers from 64K to 256K bytes of additional random-access memory (RAM) and can be used to store data during computation, append a BASIC program from disk, execute multiple BASIC programs from keyboard, or for any operation requiring access to large amounts of information.

The RAM Disc 64 package includes the memory card with battery backup, a pair of software packages, and a two-slot expansion interface that allows autostart cartridges to use the card's memory. The expansion interface increases the Commodore 64 CP/M cartridge's maximum available memory to 60K bytes. The programs consist of a CP/M operating system and a monitor program that permits the manual start-up of cartridge-based programs as well as tape or disk backups of the card's memory.

List price for the 64K-byte RAM Disc 64 is $370. Additional 64K-byte increments cost $70. For complete details, write Lindgren Associates, 127 Main St., Brattleboro, VT 05301.

Circle 215 on inquiry card.



Blue Chip

An inexpensive letter-quality dot-matrix printer

Blue Chip Electronics' M120/10 is a near letter-quality dot-matrix printer that connects directly to a wide variety of computers, including the Commodore 64.

The $349 printer is available in two versions: one configuration includes an adjustable tractor-feed mechanism, the other offers an 8½-inch friction-feed platen and manual sheet loader. Both units feature a printing speed of 120 characters per second, a 9 by 7 dot matrix, forward and reverse paper movement, and a self-test mode. Centronics-compatible parallel and Commodore-64 interfaces are standard. RS-232C and IEEE-488 interfaces are also available.

Write for additional details from Blue Chip Electronics Inc., 7406 East Butherus Dr., Scottsdale, AZ 85260.

Circle 214 on inquiry card.

A Place for PCs

The PC Workcenter surrounds your IBM Personal Computer with high-tech style

Still looking for a suitable home for your IBM Personal Computer? Wright Line's PC Workcenter offers a stylish and practical approach to the computer-storage problem

Features include a roll-out keyboard shelf, a sliding printer drawer with self-feeding paper tray, and a lockable hide-away tambour door. Other standard items include a bin drawer that holds computer media and drop-file folders, a master on/off switch with circuit breaker and multiple power outlets, locking casters, and a locking rear panel with ventilation and cable openings.

The unit is available in widths of 24 and 30 inches and heights of 50 and 63 inches. The 63-inch-high models offer an adjustable storage shelf that can be used to hold software packages, manuals, and other materials. Prices start at $775.

Further details are available from Wright Line Inc., 160 Gold Star Blvd., Worcester, MA 01606.

Circle 216 on inquiry card.

On Edge

The Leading Edge Personal Computer offers IBM compatibility

The Leading Edge Personal Computer is an IBM Personal Computer work-alike that features an 8088 microprocessor operating at 7.16 MHz and MS-DOS compatibility.

The system includes 128K bytes of random-access memory (RAM), seven IBM bus-compatible expansion slots, an 83-key detached keyboard, and an RS-232C interface. Also included are two 5¼-inch floppy-disk drives, a calendar/clock with battery backup, and an 80-column by 25-line green-phosphor monitor. The complete package, with GW BASIC and Leading Edge Word Processing, sells for $2895. Additional information is available from Leading Edge Products Inc., 225 Turnpike St., Canton, MA 02021.
Circle 217 on inquiry card.

Your Mug Runneth Over

The Magic Computer Input/Output mug

Looking for an offbeat computer-related gift? The Magic Computer Input/Output Mug ($8.95) changes messages when a hot liquid is poured into it. "Computer Expert On/Off Duty," "Programmer On/Off Duty," and "Computer Nut On/Off Duty," are the three versions currently available. According to its manufacturer, the 10-ounce mug is user friendly. Contact Sweet Gum, 15490 N.W. 7th Ave., Miami, FL 33169.
Circle 220 on inquiry card.

A Random-Access Vision

A memory expansion card for the Apple

The Vision 128/256 Memory Expansion Card ($295) adds 128K bytes of random-access memory to any Apple II computer. Expandable to 256K bytes, the card can be used in any peripheral slot in the Apple.

More information is available from Action Research Northwest, 11442 Marine View Dr. SW, Seattle, WA 98146.
Circle 218 on inquiry card.

Don't Give Me Static

The First Touch Static-Control Computer Pad guards your system against ambient electrical charges

Static electricity can be one of a computer user's biggest headaches, causing system-memory loss, garbled or lost data, and video interference. Now the First Touch Series 9200 Static-Control Computer Pad offers a convenient and cost-effective answer to this nagging problem.

Priced at $69.95, the 24- by 26- by ⅛-inch pad protects any computer's circuitry against static-induced damage or degradation by draining electrical charges from operator to ground in less than a half-second. The pad, which can be trimmed with scissors to fit a specific work area, is equipped with a ground cord that attaches to any convenient grounding source. Its vinyl surface resists alcohol, water, coffee, and food spills and can be cleaned with soap and warm water.

Complete details are available from 3M, Dept. DR83-26, Box 33600, St. Paul, MN 55133.
Circle 219 on inquiry card.

Video Printer

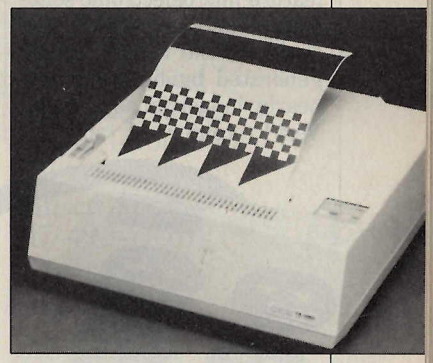
The TX-1000—what you see is what you print

A printer that doesn't require an RS-232C, parallel, or any other commonly-used printer interface? Axiom's TX-1000 is a fixed-head thermal video printer that connects to a computer's raster-scan video-output jack, providing high-resolution hardcopy output of video-display images.

Priced at $3395, the unit can print complex graphics, alphanumeric characters of any size, and a complete array of scientific, mathematical, and foreign-language symbols. Two simple controls allow variable picture positioning and magnification. Users can also vary the image's aspect ratio to compensate for screen distortion.

Compatible with ordinary 8½-inch-wide paper, the TX-1000 accepts a wide range of video signals, including the industry standard RS-170. The printer offers a switch-selectable resolution of up to 160 dots per inch and can print a complete screen in about 20 seconds. The unit includes built-in test pattern and signal-diagnosis modes.

For details write Axiom Corp., 1014 Griswold Ave., San Fernando, CA 91340.
Circle 221 on inquiry card.



Little Brother

The HR-5—a lightweight, battery-operated printer

Weighing only 3½ pounds, Brother International's HR-5 printer works with a wide variety of desktop and portable computers.

Features include a printing speed of 30 characters per second and an 80-column output on thermal or ordinary paper. The HR-5 also provides a 9 by 9 dot matrix, bidirectional text printing, graphics, parallel and serial interfaces, and two line-space settings. The unit can operate from internal batteries or, with an optional adapter, AC lines. The HR-5 is priced at $249.

Complete details are available from Brother International Corp., 8 Corporate Pl., Piscataway, NJ 08854.

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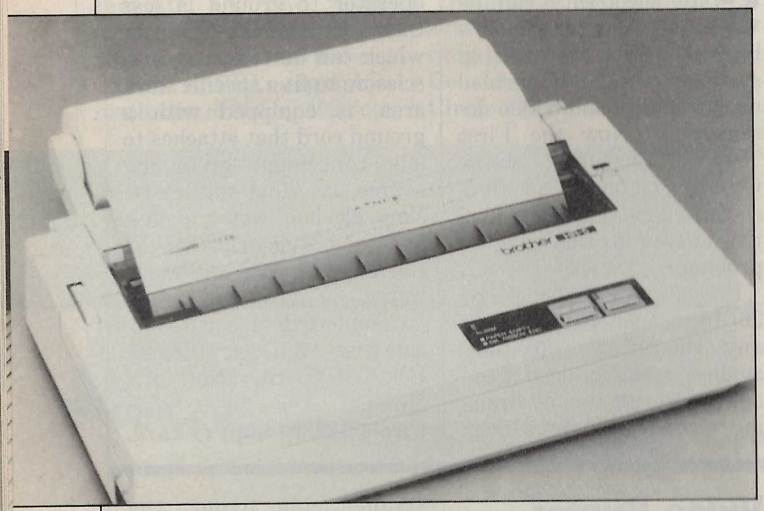

Stopping the Surge

Veri/Protektor and Veri/Protektor II filter out line surges before they can reach your computer

Verité has unveiled a pair of voltage-suppression devices that protect computers and peripherals against harmful transient electrical surges on power lines.

Veri/Protektor ($44.95) and Veri/Protektor II ($69.96) feature microelectronic solid-state voltage suppressors that choke off the voltage spikes generated by lightning and nearby industrial equipment. Veri/Protektor II also includes a line filter that eliminates electromagnetic interference. Both units are housed in a metal cabinet that features four duplex outlets, an on/off switch with indicator, a 6-foot grounded extension cord with plug, and a 15-amp circuit breaker.

For additional details, write Verité, 1614 West Anaheim Rd., Harbor City, CA 90710.

Circle 225 on inquiry card.

Buying in Bulk

The Beck 25 Pack—cheaper by the two dozen plus one

Beck Manufacturing offers a cost-effective alternative to the traditional box of ten 5¼-inch floppy disks.

The Beck 25 Pack provides buyers with 25 hub-reinforced disks that meet ANSI standards and are certified to be 100 percent error free. Each pack also includes a full supply of Tyvek storage envelopes, color-coded labels, and nonmetallic write-protect tabs.

A box containing single-sided double-density disks sells for $54.75; 25 double-sided double-density floppies are priced at $69.75.

For complete details, write Beck Manufacturing, POB 111, West Peterborough, NH 03458.

Circle 223 on inquiry card.

Mush, Mush

The Husky Hunter briefcase portable computer

The Husky Hunter is a briefcase portable computer that offers up to 208K bytes of battery-backed CMOS memory. The 2-pound, 8½- by 6¼- by 1¼-inch unit includes a 40-character by 8-line liquid crystal display, five character sizes, tabs, and graphics. Housed in a durable, waterproof case, the unit also features a BASIC interpreter and full CP/M compatibility (programs must be downloaded from another CP/M-based system). The Husky Hunter is priced at $2995 (with 80K bytes of user memory) and $4995 (208K bytes of memory).

Complete details are available by writing to Sarasota Automation Inc., 1500 North Washington Boulevard, Sarasota, FL 33577.

Circle 224 on inquiry card.

Case Closed

ATS computer travel cases protect on-the-go computer equipment

ATS computer travel cases offer travelers a rugged, lightweight way to transport computers, disk drives, printers, and associated equipment.

Each ATS case includes a high-density fully sculptured interior that insulates contents from shocks and jolts. Double-wall extrusion angles, full-length piano hinges, and a special high-impact ABS plastic/wood lamination give the cases extra strength and support. The cases exceed Air Transport Association requirements and come with a five-year parts and labor warranty.

For complete details, including information on sizes, prices, and custom cases, contact ATS Cases Inc., 25 Washington Ave., Natick, MA 01760.

Circle 226 on inquiry card.

1-2-3 from Lotus.

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InfoWorld
April 16, 1984

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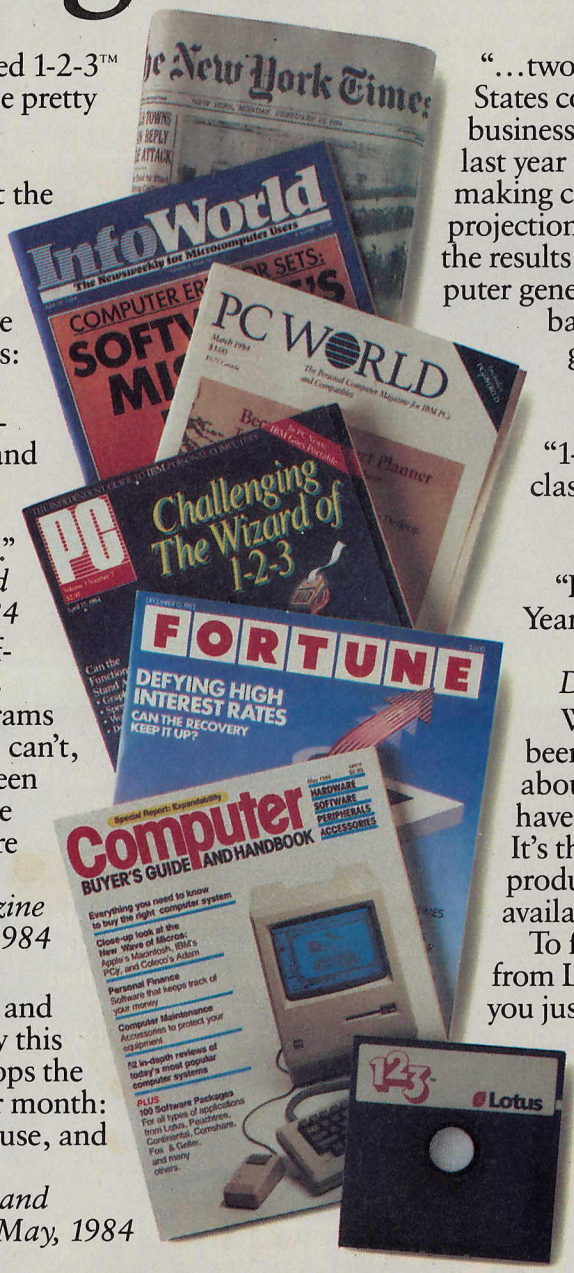
PC Magazine
April 17, 1984

"Sit down behind 1-2-3 from Lotus Development and you'll never again ask why this $495 business program tops the best seller list month after month: it's fast, efficient, easy-to-use, and sometimes, even fun."
Computer Buyer's Guide and Handbook *May, 1984*



"...two thirds of all United States companies buying business microcomputers last year chose 1-2-3 for making complex financial projections and displaying the results instantly in computer generated pie charts, bar charts and other graphic displays."
New York Times
February 13, 1984

"1-2-3 is still in a class by itself."
PC World
March, 1984

"Product of the Year 1983"
Fortune
December 12, 1983

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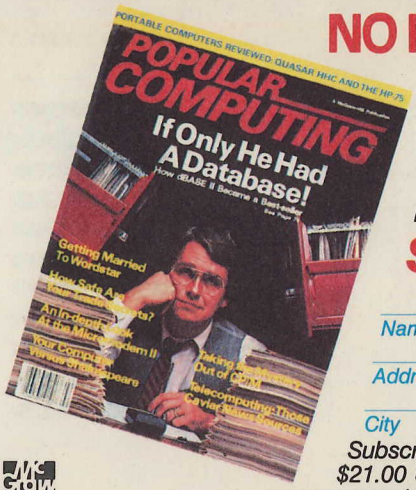

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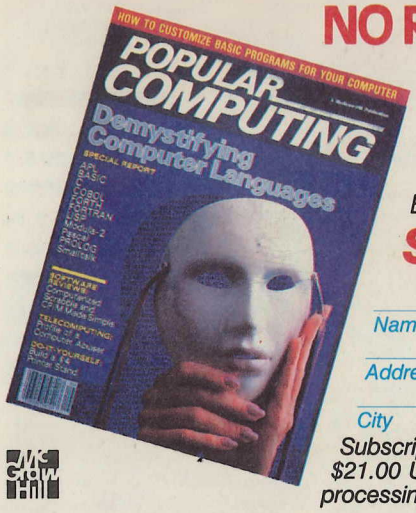

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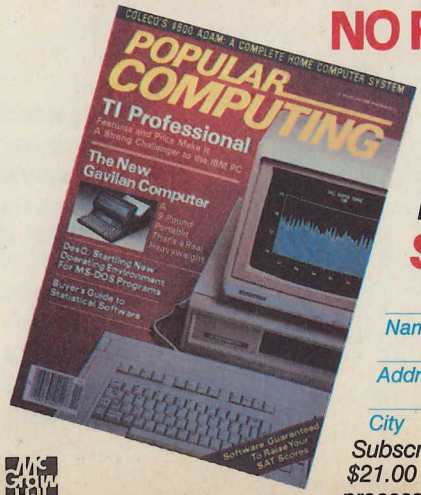

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P.S. You'll be glad you did.

Letter from Hong Kong

A report on Chinese food, fake Apples, and IBM's Asian strategy

by A. Richard Immel

The dancing is over. I'm sitting in Hong Kong's Kai Tak airport, fat with a week's worth of reporting and, I'm pleased to say, with more than one outstanding Chinese dinner pressing against my belt (a few bad ones, too—don't believe everything Calvin Trillin writes about Chinese food). While I wait for United Airlines to tighten the bolts and stuff some extra gas into the DC-10 we're flying home on, here are some thoughts on such diversities as fake Apples, IBM in Asia, 1997, and Silicon Valley: Hong Kong style. But not necessarily in that order.

Just as I feared, the week was a whirlwind of briefings. Briefings with businessmen, briefings with government officials, and those most incestuous of events, briefings with other journalists (at the Foreign Correspondents Club, of course, a place that bears an uncanny resemblance to the intergalactic bar scene in *Star Wars*).

My first significant observation after a week in this Disneyland of free enterprise is that Hong Kong has *not* been hit by the microcomputer bug. That may sound odd for a place that is doing everything in its power to lure the U.S. electronics industry to its shores, but it's just a minor inconsistency among a thousand contradictions. You can buy just about any brand of micro you want here—American, Japanese, or European—but outside of the Ataris, Commodores, and (mostly fake) Apples, which you can get in most camera and stereo shops, it's not easy to find them. Computerland, the McDonald's of micro retailing in the States, has a store here, but only one, and even IBM has only four outlets in all of Hong Kong for its PCs—this in a place with some 90,000 businesses and a population pool of 5.5 million. IBM says that it sold "well over 1000" PCs in Hong Kong last year, but that was *all* of 1983, which tells you something right there. As a local IBMer explained it to me, microcomputer sophistication in the Hong Kong business community is "not nearly what it is in North America or Europe."

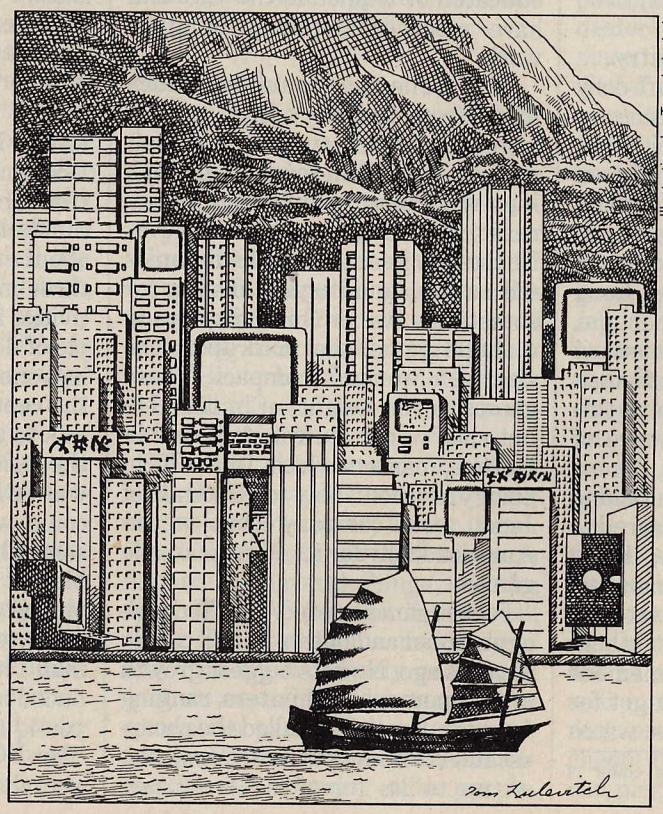

Illustration by Tom Lulevitch

At one point during an interview with the chairman of Hong Kong's bank cartel, I thought I had a live one when I spied a terminal glowing green in the cool darkness behind his leather chair. Afterward I asked him if it was a personal computer that he used himself. "Heavens no," he said. "I have people downstairs to do that." The unit in his office was just a terminal used to look up Reuters news service bulletins and currency exchange rates.

This is not to say the colony is averse to computing per se. Far from it. Data processing is well entrenched in the bigger companies, at least, and many small ones routinely install multiuser minicom-

← Circle 12 on inquiry card.

puter systems. The phone company is pushing some kind of videotex setup, and the newest office buildings, hotels, and shopping centers are equipped with elaborate computerized electronic surveillance and security systems. The Peninsula Group, which includes in its stable of hostelries the venerable Peninsula Hotel in Kowloon, is building a 760-room hotel behind the "Pen" that explicitly acknowledges the computer age: some of the rooms will be equipped with extra telephone jacks for personal computers and with two TV monitors, one of which will be mounted in the john.

Unlike neighboring Singapore, where it is government policy to force-feed microcomputers to society, Hong Kong still clings to a tattered but at least partially intact laissez-faire philosophy. Industry gets no direct subsidies, and schools are still in the early stages of experimenting with personal computers in the classroom, where the emphasis is on computer science rather than computer-aided instruction.

Growing Electronics Industry

Having said all this, one can't deny Hong Kong's growing importance as a player in the worldwide electronics industry. Both the U.S. and Japan continue to increase their already significant investments here. In terms of employment, electronics ranks third in the Hong Kong economy, well behind number one, clothing, but almost abreast of number two, textiles. It's the fastest-growing part of the economy—this despite the official indifference of the government.

When I say electronics I'm talking about everything from the sacred to the profane. For example, Hong Kong is the world's largest manufacturer of quartz electronic watches. Some of them are fine, but others are, well, less than fine. Remember that $3.95 digital watch you got for buying a tankful of gas—a watch that lasted about as long as the gas did—it was made in Hong Kong.

The government has been trying to soft-pedal this kind of schlock image and to recruit more solid technological citizens. It seems to be working. A number of major U.S. manufacturers assemble sophisticated electronic equipment here, among them, Digital Equipment Corp., which makes its Rainbow micro in the New Territories and is building a four-story manufacturing and assembly plant in Shatin, one of the Colony's half-dozen industry-oriented "new towns" north of Kowloon on the mainland.

Silicon Valley East

But even more important for Hong Kong is its burgeoning home-grown high-tech electronics industry. The names aren't exactly household words in the U.S.—Redofin, Lambda, Soundic, and Video Technology are four of them—but they represent an important trend here: local companies started and run by young Chinese engineers and entrepreneurs, many of whom were either educated or trained in the U.S. and have returned to Hong Kong to work.

In a scene that could have been lifted from Silicon Valley, rows of women in smocks and bandanas sit at their American-made chip-bonding machines, gluing microprocessors to tiny game circuit boards. These will go into hand-held games with a flat, liquid crystal display (or sometimes two or three displays in a single game) that fold up to the size of a woman's compact. These games never caught on in the U.S. but they're hot stuff in Asia and in Europe, markets where Video Technology is second only to Nintendo of Japan, the company that we in America know for its coin-op arcade games.

Pocket games were Video Technology's bread and butter until a couple of years ago. Now its biggest growth area is personal computers, ranging from the Laser 200, called the cheapest full-color computer in the world, on up to its top-of-the-line Laser 3000, which is essentially an enhanced Apple II-compatible machine. The company also makes a 5¼-inch disk drive and a tiny four-color printer no bigger than the disk drive. These products are all good-looking and well engineered, but what's most interesting about them is price: the computers range from $100 to $700 (U.S.), and the disk drive and the printer both sell for less than $200.

Well, that's easy to understand. Cheap labor, right? Maybe not. Workers here average about $HK 80 a day (or $10.25 U.S.) while engineers' salaries range from $500 to $1500 a month (U.S.) depending on experience. This isn't high by U.S. standards, but in Asia it's right up there. In fact it wasn't until the value of the Hong Kong dollar tumbled last year that the Colony once again became competitive with archrival Singapore. But Cheuck Wah To, Video Technology's director of development, points out that only about 10 percent of a product's cost is labor. The secret is favorable import and export terms (Hong Kong doesn't tax trade) and ruthless engineering and design or what Mr. To terms "cutting costs without cutting corners."

IBM's Hong Kong Outpost

So much for the up and coming. How about the entrenched and intimidating? I am speaking, of course, about our large blue friend with the three initials. IBM's Hong Kong activities are partially housed on a couple of floors in the Landmark Building, one of a zillion new high-rises in the central district. I went there to talk to an IBM sales manager about the Asian micro market. Because it was IBM, I planned my arrival so I could walk in exactly on the dot—somewhat unusual for me—and then blew it when I got off the elevator on the wrong floor.

Anyway, I finally found the gentleman I had come to see and he introduced me to his associate, a pleasant young man whom he referred to as "Mr. PC," apparently because of his encyclopedic knowledge of that ma-

A. Richard Immel is a contributing editor of *Popular Computing*.

chine and its sales potential. Incidentally I don't know who ever started the canard that IBM people the world over wear identical blue pinstriped three-piece suits. It's untrue. These two IBM men wore identical *gray* three-piece suits.

My plan was to probe IBM's Asian PC strategy and, who knows, maybe shake loose a few hints about new products. Every journalist worth his salt knows execs usually have their guard down when they're away from the home office. Might not the same thing hold true for an overseas office of a multinational company? As it turned out, it did not; my barb-like questions invariably landed in jelly. Market share? Hard to tell; the Hong Kong government doesn't keep numbers on imports. Laissez-faire, you know. Competition? Same as the States; we compete with everybody. Sales outlook? Great potential. I was getting all this terrific stuff when the manager finally said something that put it all in context: "We do business along the same lines as any other IBM office." He smiled. Mr. PC smiled. The public relations woman smiled (you *never* interview IBMers without a flack around). Then I smiled, too, basking in the warm glow of the Universal Truth. No smart-aleck reporter from California was going to knock off these gatekeepers for one of the great corporations of the world. That is to say, no IBM beans would be spilled on that particular day within my earshot. We shook hands, smiles all around, I picked up my four-color IBM brochure ("IBM in Hong Kong") and a glossy magazine story about IBM's fascinating contributions to Asian society (reprinted from *Modern Asia* magazine) and left for my next appointment.

I don't know if it was compensation for my failed attempt at IBM or if it was just my jet lag starting to act up, but instead of taking a cab I did a foolish thing: I boarded a trolley car, one of those ancient double-decker trams that had to be old when Queen Victoria was a girl and which, I was told, would take me where I wanted to go. I never got there. As the thing ground on into the hinterland of Hong Kong Island, the buildings got older and blacker and English melted away from the shop signs.

By the time I reached the Chinese Funeral Home, I was 40 minutes into what should have been a 20-minute ride and I had had enough. I climbed down from the creaking tram and with the help of some friendly locals found a bus to take me back to the Star Ferry and my Kowloon hotel. I had no sooner flopped on the bed when the phone rang. One of the most disorienting things that can happen to you when you're tired and on the opposite side of the globe from home is to get a local phone call from a stranger who knows your business. "I hear you're looking for fake Apples," the voice said. "I can help you."

In Sham Shui Po you can buy an Apple Pascal software system with manuals and four disks for $23. A copy of Apple Logo or DB Master sells for $10.

Fake Apples

Now, I had been in town long enough to know a blind panda could find fake Apples in Hong Kong, but I was pressed for time and my mystery caller turned out to be a writer who had just researched the subject for a local computer magazine. His name was Phil and he turned out to be a gregarious sandy-haired Glasgow Scot by way of Sydney, Australia. He had one of the strangest accents I've ever heard.

The next day we went to Sham Shui Po. All week I had been turning that name over in my head. Sham Shui Po, in north Kowloon, is famous for several things. It's the most densely populated district in all Hong Kong, which means it's probably the most densely populated spot on earth. It's also famous for computers, particularly the counterfeit kind. When we arrived the intersection was teeming with people, browsers like ourselves and vendors selling hot snacks off street carts—local goodies like steamed corn on the cob, sugar cane, and hot octopus. Hands on wallets, we shouldered our way through the crowd to an unmarked doorway between a movie theater and a dentist's office, climbed a flight of stairs, and arrived on the crowded second floor of the Golden Shopping Center.

It was an assault on the senses. Low-ceilinged corridors were lined with glassed cubicles about 10 by 10 feet, each one chock full of computers and computer parts. There were keyboards, motherboards, cases, disk drives, printers, racks of software, books and magazines. You name it and it was there, lining the windows and jamming the shelves. There were full-color Apple posters—the kind you see in Apple dealers' stores—pasted all over the place. The computers looked a lot like what you see in the States: there were Apple IIs, and Franklins, and IBM PCs with detachable keyboards. There was only one thing wrong: inside each and every one of those look-alike plastic cases was a fake Apple II, assembled in Hong Kong from parts made in Taiwan or Japan. When I looked closer I noticed the names were different: Appollo, Golden 7, and Boss 1. In some cases there was no name at all, just a blank spot where "Apple" usually goes on the front of the case.

Just how many non-Apple Apples are sold in Golden Shopping Center's roughly 200 shops (on three floors) is hard to say. Phil calculated sales at roughly $5 million a year. Apple officials have said that only one of every ten alleged "Apples" sold in the Far East is theirs; the rest are fakes. They're also dirt cheap. For less than $250 U.S. you can pick up what is functionally an

Apple II. In fact some of these machines are probably better than an original because some models come with extra features like built-in CP/M and 80-column screen circuitry, enhanced keyboards, and the like. The cheapest versions are the ones from Taiwan; for about 30 percent more you can get a better-quality model with Japanese parts in it.

Software While You Wait

Or maybe you're interested in software. How about a complete Apple Pascal system with manuals and four disks for $180. Make that HK $180, which translates to $23 U.S. Or how about Apple Logo and DB Master for $10 U.S. and Magic Window for $5? Pick them off the rack, or copies made while you wait.

As recently as last year these same shops were selling computers complete with the Apple name and logo on them, but after Hong Kong Customs agents raided 47 shops, confiscated dozens of computers, and charged the owners with trademark violations, the shopkeepers wised up. They separated the machines from the logos and presto, no more violation. At least not in the eyes of the Hong Kong law. Apple's view on this is another story. It maintains that because every one of these machines uses the Apple proprietary and copyrighted ROM (read-only memory) chip, the sellers are violating Apple copyright.

A few days earlier I had spoken with Hong Kong Customs Officer John Howard, who explained this sticking point in Hong Kong/Apple relations. It seems that under Hong Kong law only trademark violations are criminal offenses; copyright and patent violations are civil offenses which the government steers clear of because they are so time-consuming to resolve. Besides, Howard pointed out, "copyright is not settled in international law."

Howard said he keeps an eye on the Golden Center and every few months "we send a couple of blokes up there" to check on things. But it's getting harder for his agents to sneak in undetected because their faces are known. "On one occasion we went in and they put out all the lights," he said.

"Day Late, Dollar Short"

The impression around here is that Apple was a day late and a dollar short in getting its act together. Hong Kong officials say Apple was slow to get its trademark registered in Hong Kong and even then only got interested in the problem after all of this funny fruit started walking through Customs in the States. (Today U.S. Customs officials routinely seize fake Apples that naive buyers try to bring into the States.) There's also concern here that in its zeal Apple is bruising fledgling local companies that are making legitimate computers that are not fakes but what some term "flattering copies."

In a sense you could say the issue is academic. "Most of the people who buy these things are students," says my fake Apple expert. "They couldn't afford a real Apple anyway, so the company hasn't lost any significant sales." Indeed, Apple is probably involuntarily responsible for the computer literacy of much of Hong Kong's present high school and college-age youth. The irony of this is that back in the States Apple has been trying mightily to get the federal government to let it give computers to schools in return for tax credits (it succeeded in California, where it gave away 9000 of them).

Many people here now feel that the counterfeit Apple situation has about played itself out and that the next focus will be IBM. Although the local IBM people I talked to claimed they weren't aware of any counterfeit PCs, copying has already started. I saw one fake machine, still in its shipping box, that had just arrived from Taiwan, and the local scuttlebutt is that underground shops in both Taiwan and Hong Kong are gearing up to crank them out in large numbers.

Unlike Apple, IBM has taken elaborate precautions to protect itself. The company put together a two-day seminar in Hong Kong in which technical experts from the U.S. explained what was proprietary and what wasn't and IBM lawyers gave opinions on what could be done in each country to block counterfeiting. How effective this will be remains to be seen.

Of course both Apple and IBM can take a certain measure of satisfaction in all of this. As the saying goes in Hong Kong: "Nobody counterfeits an unsuccessful product."

You Can Still Get Rich

Well now, here I've gotten to the end and not even mentioned 1997. That's the year British Hong Kong's leases with the Chinese run out and China takes back the real estate. The hot words have cooled and now it's mainly talk, talk, talk between British and Chinese negotiators. China is now such an integral part of Hong Kong's economy—you name the wicked capitalist activity and the people from the People's Republic are engaged in it—that economic continuity seems a certainty. The British may be invited to stay on and help run the place, but if not, they can always go home; the "foreigners" who are just here to make money buying, selling, and making things, including computers, will undoubtedly be welcomed with open arms by the People's Republic because the Communists know by now what makes Hong Kong work. Unfortunately that still leaves 98 percent of the population with no alternatives—no passports and no prospects for getting any. The Communists say "trust us," but who knows? The people of Hong Kong want guarantees but all they can get are promises.

Aside from that it's business as usual with only slightly more urgency attached to achieving the classic Hong Kong business deal: turning your money over every five years. What that means in the remaining 13 years, a government official told me, is this:

"You can still get rich 2½ times before the lease runs out." □

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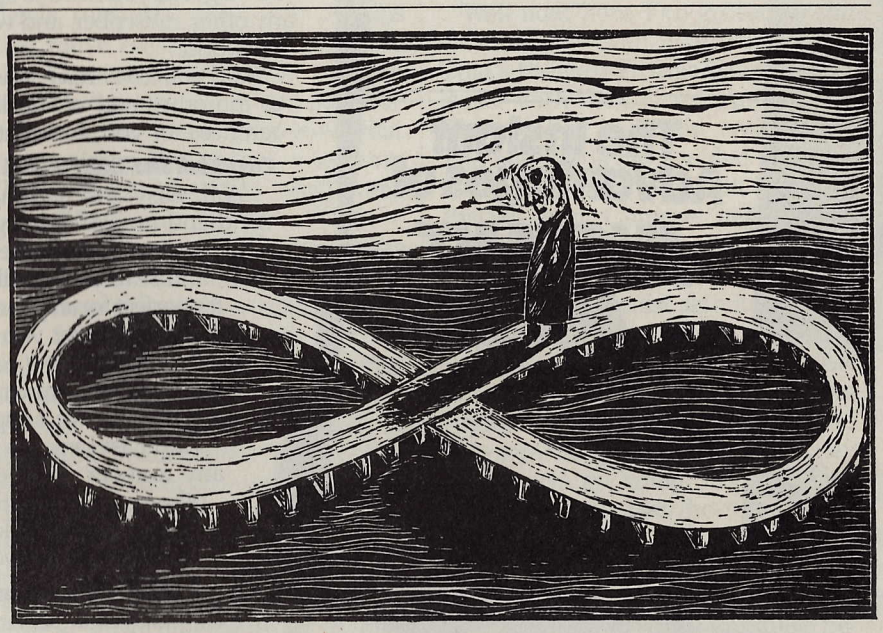
Getting Help

Finding an answer to a specific problem is almost impossible these days

by Steven Levy



A strange phenomenon occurs when you write a computer column. People regard you—when they write to you, at least—as a sage, a font of digital wisdom, a person in deep contact with the secret ways of the computer world, a soothsayer perfectly poised to dispense advice. I'm sure that some computer columnists live up to this high standard, and I am always impressed by those wizards who shoot off answers one by one to the most arcane requests. There is an excellent example of this kind of computer-trivia gunslinging in this very publication, the section called "Ask Popular." Why some people with baffling technical dilemmas choose to ignore "Ask Popular" and instead choose to "Ask Levy" is beyond me. The result is disheartening. After a session with my own mail, full of positively mind-boggling questions, I often feel like some imposter.

You say this is due to computer illiteracy on my part? Bite your tongue! I am a veteran, owning my Apple II Plus for well over two years, long enough to consider those people who own Apple IIes whippersnappers. I go back; I can recall a time, if I concentrate deeply enough, when there was no computer more portable than an Osborne. However, I admit that my knowledge is far from encyclopedic. And encyclopedic knowledge still seems to be required to compute, even in this belated stage of the "user-friendly" game.

Blessedly, many of the letters, especially those I receive electronically, do not challenge me with tough queries. Some suggest ideas for the column, and others are from discerning souls who voice approval of things I have written. Judging from these letters, I am avidly read by a hard core of computerists who have yet to reach the age of 20. Some of my favorite mail comes from this group—like the affecting epistle from a 15-year-old resident of Batu Pahat, Malaysia, who praised my writing style, told of his progress as a programmer, and, now that he had disposed of preliminaries, ran off some pointed questions on how he might use his computer and a modem to compromise the security of NORAD computers in the United States. (Note to U.S. security forces: I stonewalled.)

But many of my correspondents have more technical questions, and beneath the cordial tone of the letters I sense a frustration. It is the welling anger of people eager to take their machines to the limit, to fulfill their expectations of the computer revolution, but finding their paths blocked by an obstacle that no one around knows how to surmount.

A letter, for instance, from Allan Byam of Belchertown, Maryland. Is there a software package, he asks,

Steven Levy is a contributing editor of *Popular Computing*.

Illustration by Frances Jetter

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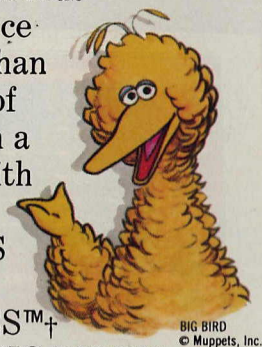

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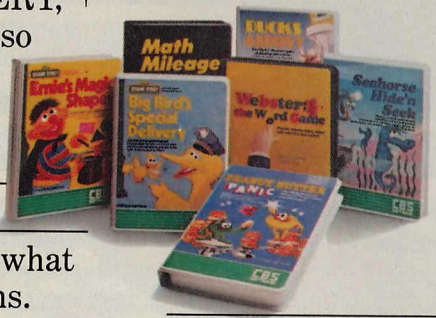

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that communicates with TTY/TTDs? It seems he visited a store recently that had a software package that might have had that capability, but "none of the salespeople could demonstrate the program." Personally, I had to look up TTY/TTD before I even knew what Allan Byam was talking about. (A TTY is a teletypwriter but in all the computer dictionaries I checked I couldn't find what a TTD is.) I suspect if Mr. Byam had read my column more often, he would have sensed that I was more the J. Random User-type journalist than the "Ask the Silicon Sage" figure he supposed me to be. After all, in my year of writing a telecomputing column, I suppose I was the only one covering that beat who ever admitted not knowing what a "null" was.

Still, the questions persist, questions that range from specific technical dilemmas to sweeping problems that would require a whole column—sometimes a whole book—to answer. Like the eloquent, witty letter from the State Department executive in Dakar, who seemed to be asking me how he might bring the nation of Senegal into the electronic age by hooking up remote villages to The Source and Compuserve.

A Ph.D. in Wordstar

Everybody with computers seems to have questions, and true experts are hard to come by. Beginners often flock to the feet of someone who even hints at some knowledge of computers. Just the other day I received a call from an old friend. After 15 minutes of small talk, his voice became somber, as if it was time for some sort of serious business to be transacted. "I got a Kaypro," he intoned, and from then on, at his urging, the conversation became a tutorial on repositioning the page numbers with Wordstar. ("The numbers always come out at the *bottom*!" he howled. "Where else in the world are page numbers at the *bottom*?") Fortunately, sheer necessity had forced me to earn enough life credits to be a Doctor of Philosophy in Wordstar, and I set my long-lost friend on the menu-driven path to knowledge.

The confusion of beginners is to be expected. But from my mail, it is clear that even those computerists who have survived the beginners stage are suffering. In my own experience, I find that you can get a false sense of security by having mastered the applications that you use repeatedly. As soon as you try something different on your machine, incredible problems arise, both in areas where you expected problems to arise and areas you never before considered as problem zones. And when something on your system just plain doesn't work, you often suspect that a simple adjustment might get things humming again—but have no idea what that adjustment might be.

Where Can You Turn?

I'm sure that some of you are on a first-name basis with the warm, avuncular fellow who runs your local computer shop—a cozy place where a bunch of friendly hackers gather around the CRT, chewing computer paper and swapping hints for the latest adventure game. If so, please tell me where you live, and I will move there instantly.

My own relations with my local computer store can be tenderly classified as detente between warring powers. It was not always thus. I bought my computer from a consultant who got me started in this strange terrain of save-files and bootstrapping. He guided me through treacherous shoals but always took care to warn me that one day he would return to Connecticut and I would be on my own. I would need a Godfather, and I should look for a computer store with young wizards (preferably polite ones) to take the helm. Try to find one of those in New York City.

I wound up buying disks and printer ribbons from a stubby entrepreneur in his twenties who looked like a cross between John Belushi and the guy in the commercial who winds up mumbling "I shouldda gone to Midas." This fellow sold stuff from his apartment on a high floor in a large Greenwich Village building. I would take the elevator there and ring the bell to the apartment. One of his assistants would look out through the peephole to see if the supplicant did not appear to be a marauder. Once admitted, I was always astounded at the place: boxes of hardware piled to the ceiling. In the kitchenette a stack of dishes almost as high. Metal shelves with boxes of shrink-wrapped software packages. You had to squinch sideways to get through to the stubby guy, who would cautiously take my order, then dispatch someone to another apartment in the building, where presumably an even bigger mess of supplies existed.

The experience had a thrilling underground feel to it. Indeed, once I had a conversation with this budding entrepreneur, and he volunteered the comparison that had been on my mind from the first time I visited his impromptu establishment: "This is a lot like dealing drugs," he said. Then a devilish smile came over his face. "But more profitable," he added.

It was around that time that the IBM PC came out, and this fellow immediately began selling it. (He sniffed at my Apple CP/M setup as a "miserable kludge.") In a matter of months, he had moved his operation into a spiffy storefront in the Village, loaded with Big Blue equipment. I would still drop in and buy disks and occasionally try to collar one of his rather knowledgeable assistants when I had an esoteric question.

That was the old days. I recently had a brush with the new order at this establishment. It occurred when I attempted to pay for some purchases with a credit card. "We add eight percent to credit card purchases," I was told. I had no cash on me, so I said all right. Then I was told that my total purchase of disks and ribbons was under the store's minumum credit card threshold of $80. I put another box of disks on the pile. "With the tax, that should put it over eighty bucks," I said.

The salesman shook his head. "We don't include tax in the minimum

← Circle 69 on inquiry card.

purchase," he said. "Why don't you buy something else?"

I instinctively turned to the magazine rack to see if I might go over the minimum with a *BYTE* or two. Then I stopped. Why should I buy something I don't need just so I can buy something from these people *and* pay eight percent over what I should be paying? "Wait a minute," I said. "There's over seventy-five dollars' worth of stuff I've piled on the counter. Do you mean to say that if I don't buy something else, you won't take the card? That you would prefer to lose the sale entirely rather than bend your ridiculous rule?"

The salesman looked me right in the eye. "Yes," he said.

I have recounted this trival anecdote in mind-numbing detail to underline a point: the once-personal world of personal computers no longer exists. The pioneers of the field had a vision, a vision of plain folks using computers to improve their lives. Before this vision could be brought to light, it was essential to slay a distinct, though elusive enemy: the horrid taint that computers have been saddled with in the minds of the general public.

Mainframe Mentality

For years, Americans had been foiled in attempts to implement common-sense solutions to their problems concerning department-store bills and tax returns, and time after time they had heard that familiar refrain from a seemingly sympathetic bureaucrat: "The computer won't let us do it that way." It was emblematic of the big-computer era, one in which mere people were slaves to the whims of those room-size monsters which demanded that we organize our checkbooks—our very lives— to serve *them*. The promise of personal computers, and my contacts with some of the pioneers in the field have convinced me that this was no small motivation, was to erase that excuse from the face of the earth. Computers would be used to allow people to do things the way *people* wanted them done.

In the hobbyist days, computer stores worked this way. They freely dispensed advice, and if you had a weird problem, they would do something to accommodate you. Not these days. If a repair is needed, it often costs the better part of $100 to get someone to *look* at your machine. As for odd requests, I only point to my recent experience in trying to get a letter-quality printout of an extensive manuscript. I approached a new store in my neighborhood (not the one mentioned above) and, noting they had the proper equipment to do it, asked how much it would cost if I brought in the floppy disks and had them print the thing on their setup. The answer: $2 a page. I was astounded. How much would it cost to *buy* the printer? I asked. Half as much as merely using it.

In the old hobbyist days, computer stores freely dispensed advice—if you had a weird problem, they'd do something to accommodate you. This is no longer true, especially if you buy from a mass merchandiser.

The absurdity of that pricing scheme seemed to escape them because my problem was not being looked at as a human dilemma. I was being processed, and the store owner's mental printout of possibilities did not allow for flexibility. Is it any wonder that people have learned not to count on dealers for solutions to their thorny computer questions? And the situation will only get worse as more computers are sold by mass merchandisers like Macy's.

The other traditional source of advice has been user's groups. I belong to one and cannot say enough for them. At user's groups, I love to watch the process of people networking together to provide help. Someone stands up and asks if the new AwkwardWriter program works with a Myopia 80-column card, and instantly some man in a threadbare three-piece suit (one of several businessmen in the group, I have ascertained, who have lost family and friends because they insist on hacking BASIC instead of maintaining human contact) jumps up and points out the difficulties of an interface. "But I've hacked up a machine-language program to fix it!" he beams, and a meeting is arranged for later.

But again, this is a process belonging more to hobbyist days than the era of mass microcomputing that is upon us. The computer in this era is more appliance than avocation. And as cynics are quick to point out, you don't see user's groups forming around toasters.

Inaccurate Computer Books

Another way to get help, one well suited to the impersonal new mass marketplace, is to consult one of the 900,000 new computer titles in your local bookstore. Good luck. At least when you get advice from a person, you know who to punch out if the advice is wrong. There are hundreds of books by eminent, knowledgeable authors with the precise information you are seeking but almost no way to verify the utility of a given book or piece of information within a book. Sometimes an author will present a particular bias as if it were pure gospel, recognized by everybody in the computer world as the way things are. To read best-selling author Peter McWilliams, for instance, one would assume that any product ever made by Apple is incapable of any but the most rudimentary word processing. You would not even suspect that hundreds of thousands of happy users (including me) hold an alternative opinion.

Often, because of a deadline, the substance of the book will concern some computer or software program that had not yet been released before the author's deadline. So you see

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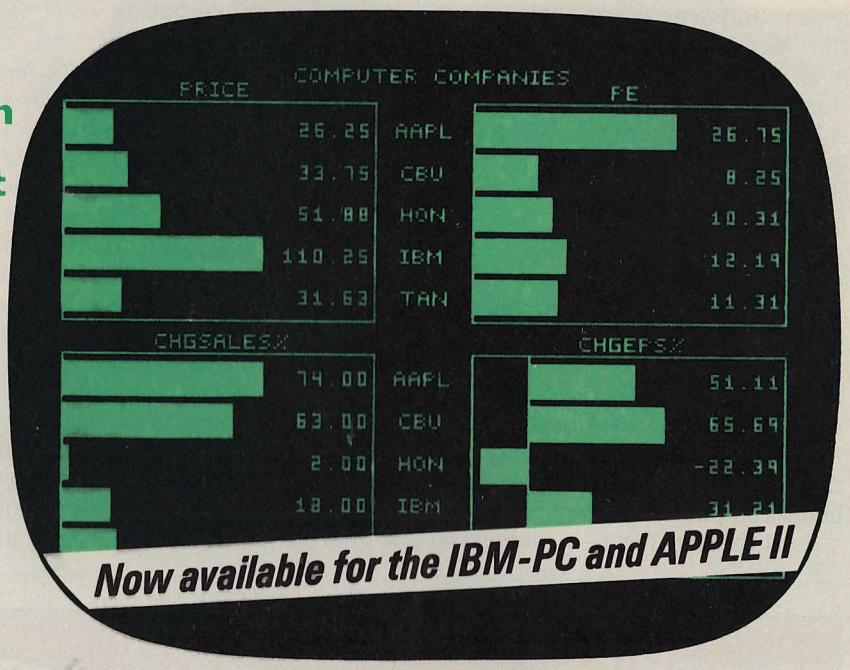

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weird aberrations. One of my favorites is in Doug Clapp's otherwise useful *Macintosh Complete* (Softalk Press, $19.95), which includes an appendix where he rates software programs he has not seen, magazines that had yet to print their first issues, and even other books about the Macintosh which had barely been contracted at the time Clapp was finishing his own book. Yet he solemnly proclaims that, besides his own book of course, one other book (written by a buddy?) was bound to be the best Mac guide.

"The Whole Truth"?

Then you have books that purport to cut through all the crap and tell it like it is. Recently I received one called *The Whole Truth Home Computer Handbook* (by Charles Platt; Avon, $5.95) which promised to "cut through the media hype and reveal home computers as they really are . . . all the true facts—including the ones all the other books have left out—about home computers." Well, the book does have some funny jokes about the varieties of people one meets in the computer world. But then, in a section about Apples, you come across a passage like this, which I quote verbatim:

> *. . . home users were left with the slow, primitive Apple II for many years. Independent suppliers started selling gadgets to fix the things that people didn't like about it, from the small memory to the 40-column text display. Finally Apple gave in and installed their own version of these enhancements in the Apple II Plus (which is what the Apple II should have been originally) and the Apple IIe which is CP/M compatible. . . .*

This is "the whole truth"? Putting aside what the Apple II should have been in the first place (most would argue the machine was rather advanced for its time), the author implies that the Apple II Plus was enhanced by a built-in 80-column display. It was not: you needed to buy an optional 80-column display. Furthermore, despite the author's implication here, the enhancements on the IIe do *not* include CP/M: for both the II Plus and the IIe, you need to buy an extra board to get that capability. But what do you want from a book (published in March 1984) that discusses the virtues of the IBM-compatible Osborne Executive II—a machine that never came out because of Osborne Computer's well-publicized travails during the previous year? This was part of the "whole truth" the author didn't seem to be aware of.

Your Friendly Technofreak

No, books are not the answer to the help problem. Something else is called for, something beyond the traditional. Recently I noticed a new kind of business rising to meet that need: a hot-line-style phone service. One such place is the Personal Touch Computer Advisory Service. For $195 a year you get phone access to someone who supposedly knows the answer to any problem you come up with. If the computer crashes at 2 a.m., just call up and a friendly technofreak will set you straight. It's an interesting idea, but I suspect that anyone knowledgeable enough to take on calls from all comers might be able to land a more desirable position than once requiring him to sit up all night by a telephone that at any minute might erupt with invectives hurled by an outraged novice who'd just been blown out by a fatal DOS error.

This versatile expert might well find gainful employment as a computer columnist. And I could start him off by sending him some of my mail. □

Editor's Note: Steven Levy still appreciates suggestions, comments, and questions that don't involve anything that would make his hands dirty. Besides writing to him at *Popular Computing*, you can reach him at Source number TCT670 or Compuserve ID 72065,635.

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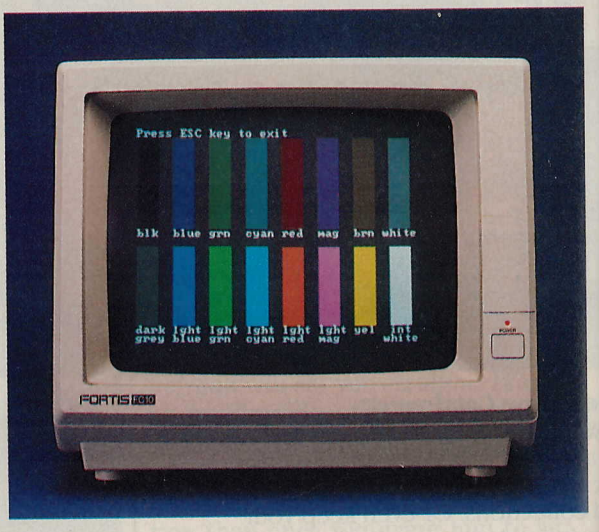

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Clearing a Path

The 16-bit operating system jungle offers confusion, not standardization

by Jerry Pournelle

Just as we thought that CP/M and Apple DOS would unify the microcomputer world, technology struck again. We moved into the world of 16-bit computers. Many observers expected history to repeat itself: one or at most two operating systems would dominate. So far it hasn't quite worked that way. Worse, as we'll see presently, the operating system jungle even affects hardware design.

First out with a popular 16-bit machine was Texas Instruments with its 99 series. TI, like many others, was too greedy. It tried to isolate its customers from the rest of the micro world. Software would only be developed internally. The result was that outside developers ignored the machine. The TI 99 eventually vanished.

One candidate standard was the UCSD Pascal operating system. Known as P-system, it had the merit of theoretical portability among many different kinds of computers. There were many Apple installations. The same P-system programs can in theory run with either 8-bit or 16-bit computers. There is a large P-system user's group, and P-system is the standard operating system furnished with advanced machines such as Sage. Given all these advantages, one might expect P-system to be a powerful unifying force.

There are several reasons why it hasn't been. First, the 8-bit P-system was extremely hardware dependent. It took expertise to get it running with new disk formats. Then P-system itself fragmented into versions. There remain P-system islands—Apple P-system with several hundred thousand users is much the largest—but most remain essentially incompatible with each other. P-system survives, but barring radical new developments, it will be outside the mainstream.

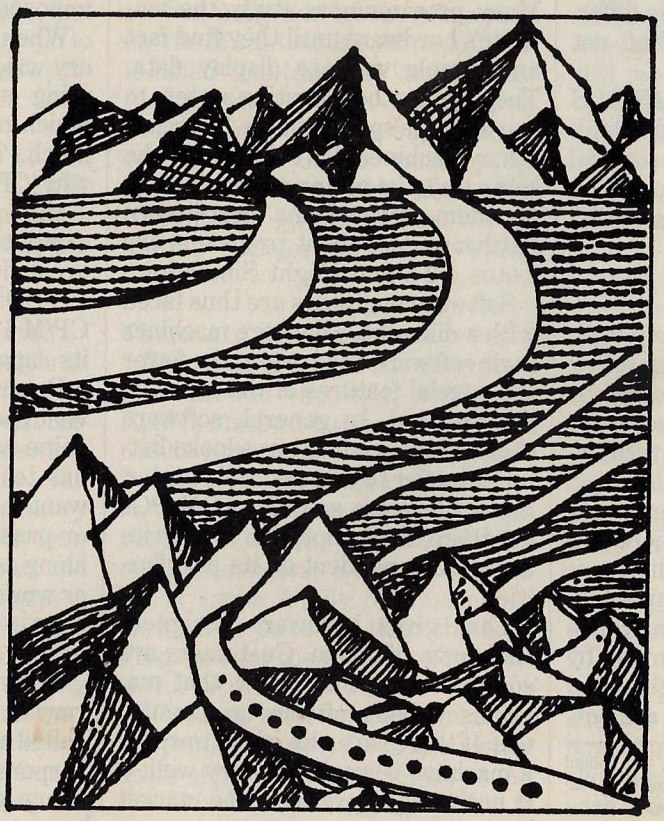

Illustration by Bob Barancik

Then Came IBM

The really major event in 16-bit history was the appearance of the IBM Personal Computer. There were faster, better-designed, and more advanced machines available, but no one could match IBM's marketing techniques. The magic initials quickly moved to dominate the 16-bit field. So many machines were sold that everyone wanted to be compatible. MS-DOS replaced CP/M—but not entirely. The micro world was fragmented.

Every computer writer has heard a dozen stories about why IBM didn't use CP/M from Digital Research. They can't all be true. Whatever the reason, IBM turned to Microsoft of Seattle to supply the operating system for the PC. Microsoft, in turn, bought the program from a small outfit called Seattle Engineering.

In the beginning, MS-DOS (for Microsoft Disk Operating System) was identical with PC-DOS.

MS-DOS had remarkable internal similarities to the older 8-bit CP/M 1.4; unlike CP/M 2.2, the first versions of MS-DOS had no provision for user numbers or subordinate directories. This made it very inconvenient when used on systems with large-capacity hard disks. MS-DOS had a few features not in CP/M 1.4 but was nothing really new. Like CP/M-86 (the 16-bit version of CP/M), MS-DOS was an improvement over what micro users were accustomed to but not a radical innovation. Although CP/M-86 was available, it was expensive, and PC-DOS sold eight times as many copies as CP/M for the IBM PC. Programs to transfer files from PC-DOS to CP/M-86 (and vice versa) evolved slowly, but the two systems were otherwise incompatible.

As time passed, PC-DOS evolved incremental improvements. Versions 2.0 and later have additional new features. The most notable is subordinate disk directories for added convenience when using large fixed-disk systems.

MS-DOS also evolved—and did not stay identical to PC-DOS. The differences are, so far, minor but not trivial.

Because PC-DOS and MS-DOS were so much alike, you might think that the 16-bit world could be unified with fairly little effort; but operating system compatibility isn't as forgiving as it sounds.

Are We Compatible?

The IBM PC sold extremely well. A lot of people wrote software for it—so much that it makes sense to divide 16-bit hardware and software into two classes: compatible with the IBM PC and not compatible.

Although that makes sense, it's not as simple as it sounds. There are many kinds of incompatibility.

The simplest form of compatibility is disk file organization: can a given machine read disks made by the IBM PC? Fortunately, this is no longer so important: there are now several programs that will transform disk files from one format to another—even from 8-bit CP/M to 16-bit PC-DOS. It's not always a trivial task, but anyone determined enough can get the files into the PC, or from it to another machine.

This is all right for data files—address lists, text, ledgers, etc. Program compatibility is another matter. Many programs that run fine on the PC won't work on other machines. The usual reason for this is "hardware dependence": the program's writer has made use of features exclusive to the PC. The most common source of incompatibility comes when the program writes to the screen.

The MS-DOS/PC-DOS operating system, like all operating systems, has standard ways to get information from the keyboard and send it to the screen. However, screens have a variety of features—blinking characters, half shade, boldface, etc. Some machines have these features and some don't. The operating system does not make provision for easy use of every possible feature. Many programmers study the machine's hardware until they find fast and simple ways to display data. They bypass the operating system to use features specific to the PC. Since other machines don't do things the same way, the programs won't work on them. Two of the best-known hardware-dependent programs are Lotus 1-2-3 and Flight Simulator.

Software engineers are thus faced with a dilemma. The more machines their software will run on, the fewer the special features of the machine can be used. In general, software that uses special features looks better, is easier to use, and sells better. Since there are so many IBM PCs out there, the temptation is to write software dependent on its peculiarities.

That gives hardware designers their own dilemma. Customers are sophisticated: they know that machines without software aren't much use. If there isn't a lot of software for a machine, it won't sell very well; if it hasn't sold very well, the market base isn't large enough to tempt software developers to write for it. The temptation, then, is to imitate IBM as closely as possible. On the other hand, there have been considerable improvements in machine technology since IBM designed the PC. Should one, then, use the latest technology or "design down" to the PC's poorer performance levels?

Thus we have two operating systems, MS-DOS and PC-DOS, that, while similar, run different programs on their respective machines. Rather than unity, we have fragmentation of a new order. If that were the only fragmentation in the 16-bit world, we might learn to cope, but technology continues to advance. The lack of operating system standards limits the development of both software and hardware.

A Better Way?

The real crunch is coming up now. Microcomputer technology has taken some real jumps in the past year. It is possible to design machines with stunning capabilities, and it is absurd to accept the limits imposed by IBM compatibility.

When micros first came out, memory was extremely expensive. Operating systems had to be *small*, which meant they couldn't do very much. This was the major reason why CP/M was so very limited.

Memory is now cheap, and new computer chips can make use of a great deal more of it; yet, because PC-DOS is still only an update of CP/M 1.4, it remains very limited in its capabilities.

Programmers are forced to reinvent the wheel. If you want the machine to do arithmetic, a program has to be written for that. If you want it to draw lines, or do music, or pass the results of one program along to another, or sort text files, or work with several different kinds of printers, you have to write programs for each task.

Many programmers build up a library of useful subprograms—usually called utilities—which they can incorporate into new efforts. Since every programmer has an idea of

Science fiction writer Jerry Pournelle, who joined the micro revolution seven years ago, is a contributing editor of *Popular Computing*.

how best to accomplish each job, these are all different, and one programmer can't use another's utilities. There's a lot of duplication of effort.

There's a better way: put more into the operating system.

For example: suppose you're writing a letter, and you need to do some calculations. Why must you exit the program in order to add up the expense account? Indeed, this is so inconvenient that many users—including me—keep a desk calculator near the computer. Clearly, your computer knows how to calculate; why can't it do it while you're writing a letter?

One way would be to write a desk calculator program into the text editor. Another would be to put the calculator into the operating system. Then *any* program could call it.

I can think of a whole raft of stuff that ought to be in the operating system, available to any program that wants to call it. Some features stand out: desk calculator, random access filer, address book, calendar, file sorter, graph and chart maker, bar graphs, pie graphs, line graphs, and conversion from one kind of graph to another. Let the output of one program be the input to another. Copy a file or archive a file.

Although there are plans to add some of these features to PC-DOS, it will still be a quick fix. What's really needed is to rethink the situation and start over.

Where Do We Go From Here?

Apple Computer's Macintosh is an example of what could be done with a new start. It's still limited, but certainly a step in the right direction. The MacOperating System is a full 64K bytes of read-only memory (ROM) and has provisions for text-editing functions, drawing lines and shapes, and displaying parts of several different programs at the same time. This latter capability is accomplished by segmenting the display screen into areas called windows.

Mac was brought out with much fanfare and little software, but a number of software developers are hard at work. The Mac operating system is highly advanced and is supposed to allow programmers to easily make use of Mac's advanced features. Apple has shown that micros need not be saddled with oversimplified operating systems.

At the same time, they've produced yet another fissure in the microcomputer community. Macintosh uses a highly specialized disk format. It's unlikely that any software developed for Mac will run on non-Apple machines. Apple has bet heavily that the machine will be so attractive that its users won't care about their isolation.

Will Unix be the wave of the future? No one really knows, and a dark horse operating system could just as easily break out and steal the race.

Meanwhile, Digital Research has produced a new operating system called Concurrent CP/M. Like the Macintosh it has windows. It also has the ability to let the computer run several programs at the same time (as the Macintosh is said to do). This is called "multitasking" and is what "concurrency" means. The next version of Concurrent is supposed to contain provisions for running PC-DOS programs as well. If so, Concurrent will go a long way toward uniting a major part of the micro universe.

There Are Still Problems

The IBM PC and its clones are built around the Intel 8088 chip. Apple's Macintosh uses the Motorola 68000. Both chips have advantages, but of course each has a different instruction set. Programs written for the 68000 can't run on the 8088 without modification. Beyond the 8088 lies a whole family of Intel chips, each more powerful than the last. Programs for the 68000 won't run on them, either.

However, as computers get more powerful, they are able to use higher levels of programming languages. As the "level" of a language rises, it gets less and less dependent on specific machines. BASIC, for example, is a moderately high-level language; many BASIC statements (such as PRINT "FOO") accomplish the same thing no matter what machine they're running on.

The first generation of microcomputers was too slow and too limited to run complicated programs written in higher-level languages. The next generation will be different. Powerful languages like Pascal, Modula-2, C, LISP, FORTH, Ada, and others will make programming much simpler and should make programs more "portable" i.e., able to run with little or no modification on many different kinds of machines.

Unification Through Unix?

There's still a problem. Concurrent CP/M (CCP/M) can bring aboard MS-DOS and PC-DOS—but we're still working with highly limited operating systems. CCP/M can access a desk calculator, file utilities, address book, etc., without abandoning the job you're working on, but those are still separate programs. They're not built into the operating system and callable by any program.

There's a second limitation: CCP/M is a single-user system. Even after CP/M had nearly united the non-Apple micro world, there were sporadic attempts to introduce something new. One, TurboDOS, was a multiuser system that enjoyed brief popularity but never reached more than a few thousand installations.

Until recently the lack of multiuser operating systems was no loss. Older microcomputers simply weren't powerful enough to support multiple users. They're getting there now, though, and the advantages of allowing a number of users to access each other's large databases, and

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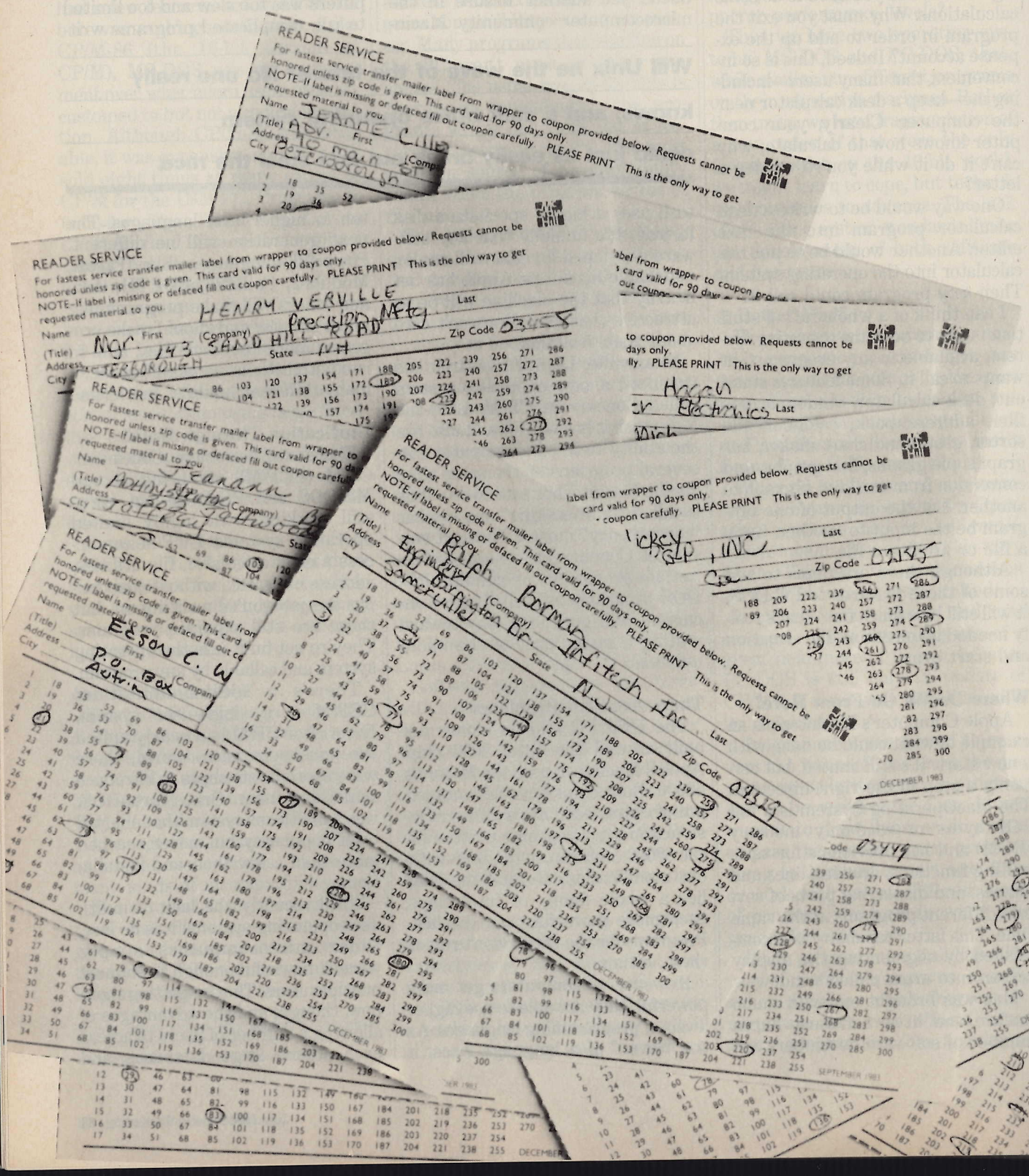

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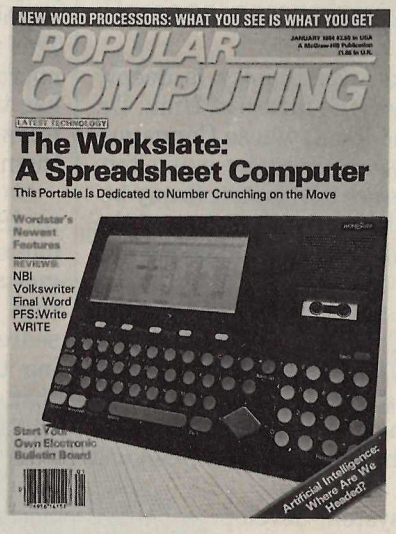

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pass work back and forth as it's completed, are fairly high.

Quite a few computer people believe we'll need a multitasking multiuser operating system, with a full set of utilities such as I have described above. Moreover, it should work on a wide variety of machines.

There is such a system. It's called Unix.

Unix was developed at Bell Laboratories and is employed in a great number of university computer systems. Unix generates strong feelings: most programmers either love it or hate it. Beginners generally hate it; Unix has command features almost guaranteed to drive you mad until you learn about them. The more experience one has with Unix, the better liked it becomes—but that transition generally takes months. Most users won't spend the time needed to love Unix.

Unix is a very flexible system. It's easily modified to accommodate new commands and even new command structures. The resulting structure is called a "shell." Unix enthusiasts often say that it's a trivial exercise to put a "user-friendly shell" around Unix. On the other hand, I have never met anyone who had actually seen that done.

Unix is very large; if you get the system for the IBM PC, it comes on 15 disks. You'd have to have a hard disk to make use of Unix, and even then it would be pretty slow on a micro.

The micro community is deeply divided over the future of Unix. Dr. William Godbout, whose Compupro computers are used by many top-rated software developers, firmly believes that Unix is the wave of the future: "Memory is coming down in price, and the new CPU chips can access up to a gigabyte. We can put most of Unix into half a megabyte of ROM. That way it will be fast and always available." He estimates that by the time we need it, the hardware costs of providing Unix on ROM will be under $200.

Other system developers believe that Unix is the wave of the past. "Too big, too slow, and too hard to use," says Sage Computer's president, Rod Coleman. "Trying to use Unix is like playing Adventure. We'll have full megabyte operating systems, and maybe a lot of it will be in ROM, but it won't be Unix."

If Not Unix, What?

A lot of micro experts don't much care for Unix but believe we'll be forced to it for lack of anything else. Microcomputers of the future will almost certainly have a multiuser multitasking (concurrent) operating system; it will be big and at least as useful as Macintosh's OS, and it should be sufficiently portable to unite a large part of the micro community.

Anything less concedes most of the market to IBM.

There's also the problem of what IBM will do. It has announced that it's going to have a windows program but hasn't said what it is. Some experts believe IBM will adopt Digital Research's Concurrent CP/M. That would have the merit of preserving all the existing software. Under this plan, IBM would encourage DRI to make CCP/M run under Unix.

Second, IBM itself could bring out Unix. PC-DOS programs would run under IBM Unix. New programs would ignore PC-DOS.

Finally, there are persistent rumors that IBM is developing a proprietary operating system, one it might not license to competitors. This would permanently divide the micro world. Every company that has tried isolating its micro customers has regretted it—but none of them was as big as IBM.

No one knows what Big Blue is up to. IBM is one of the few large companies able to keep secrets. My guess, based on slender evidence, is that IBM will support Digital Research's Concurrent while continuing to experiment with Unix and that it hasn't made a longer-range decision.

The Dark Horses

There are two more things to consider. One, AT&T has just moved into the minicomputer field. All the AT&T machines use Unix-V. It's obvious there will be microcomputers to complement the line, and that they'll use the Unix system too.

AT&T is large enough to compete with IBM. The company has little marketing experience, but it can survive a lot of mistakes. AT&T's entry into the field is a powerful blow for Unix—and AT&T is known to be working closely with Digital Research. That combination can have major influence.

Second, Niklaus Wirth is said to have designed a new operating system around his Modula-2 language. Modula-2 is aptly described as "modernized Pascal."

Modula-2 already operates in a specialized programming environment, something like a cross between P-system and the Macintosh operating system. Wirth has had a number of years to think about the future of personal computers since his Pascal language became widely accepted through its own merits without big advertising campaigns. His Lilith, a computer built in Europe to his specifications, has many advanced features and is an extremely powerful programming tool. Programmers who try the Wirth operating system hate to go back to anything else.

An operating system based on Modula-2 would have many highly attractive features. A number of hardware firms, including Compupro, Corvus, and Sage, have expressed interest in adapting the Modula-2 system for their machines.

The micro world still has room for new and brilliant ideas. A standard operating system would herald a flood of useful new software. Continued failure to adopt a standard operating system—even one less than optimum—benefits only very large companies like IBM. It's vital that something be done so that we can get on with the computer revolution. □

Jerry Pournelle welcomes comments from members of the micro revolution. Write to him c/o *Popular Computing*, POB 397, Hancock, NH 03449. Jerry tries to answer all his mail but cannot promise individual replies.

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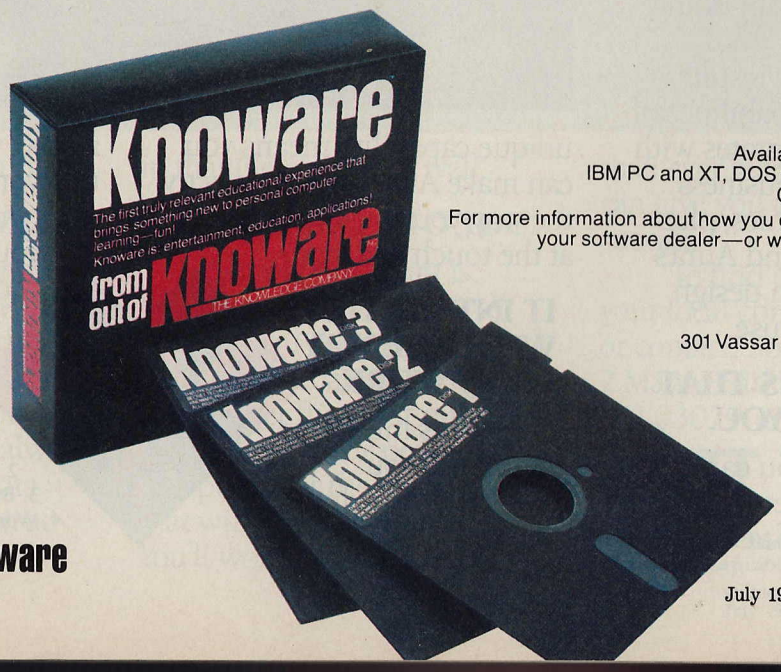

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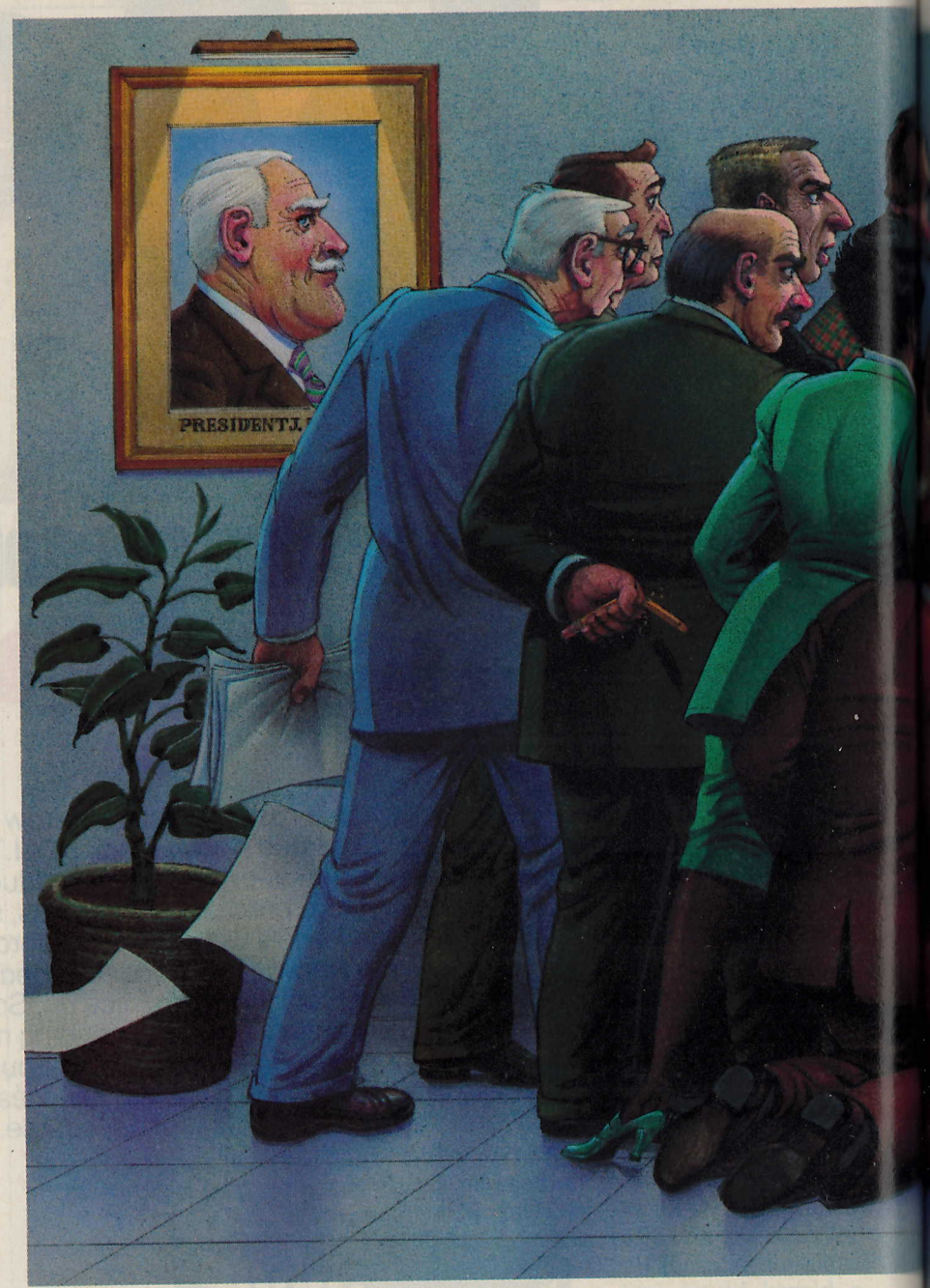

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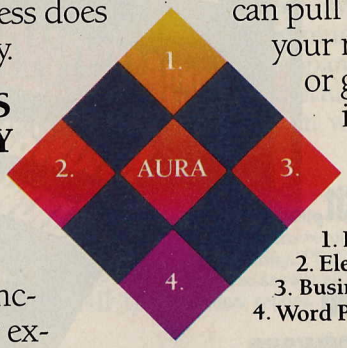

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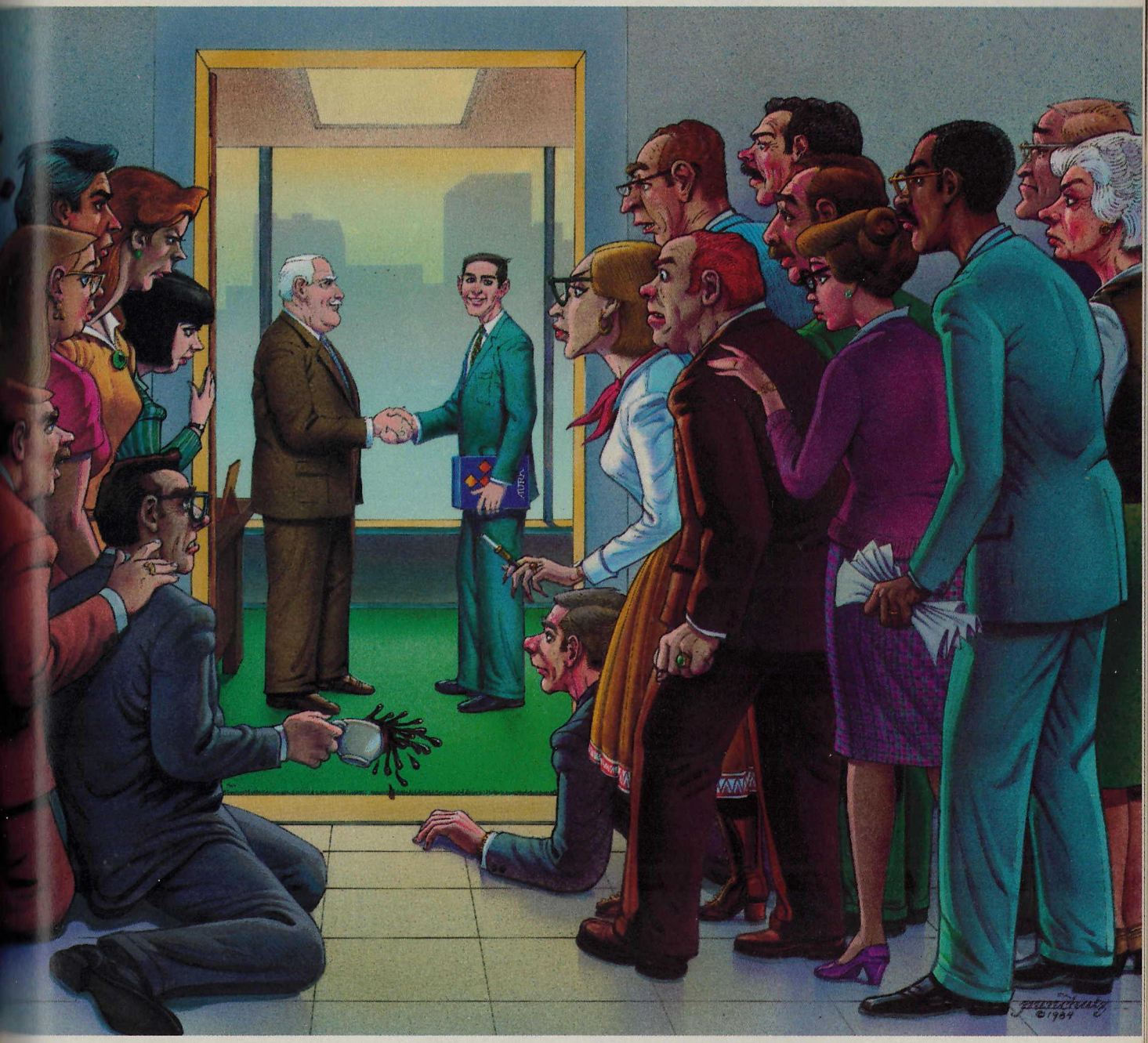

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Computer Evaluation Cometh

Accountability promises questions, not answers, about kids and computers

by Dan Watt

As computers settle permanently in schools, the evidence that students respond to the machines in the instructional process is easy to find. But as it is with all projects, the time is rapidly approaching when we must evaluate the effect of computers in the classroom in more detail.

In the beginning, many people viewed the computer as a teaching machine, replacing the imperfect human instructor with the infinite patience of a mechanical device. We now know that definition doesn't characterize classroom computer use, but what exactly is the computer doing to the teaching and learning processes?

We don't have any hard data to answer that question. One major reason is that educational computing remains in its infancy. Educators are focused on starting new programs, acquiring computers, training teachers, developing software and curriculum materials, and learning what computers can do. Premature attempts to measure the success of these new programs could destroy them before they get off the ground.

"I can't tell you how many researchers have asked to come in and evaluate what the kids in our project are learning," says Martin Schneiderman, educational coordinator of an $8 million, 89-school computer implementation effort sponsored by IBM (see "The IBM Connection," December 1983, page 75). "But we said Whoa! The computers have just arrived. Our project could be sabotaged if the teachers and kids have to be concerned about performance on a test before they even try anything new. In the IBM program, we've been pretty firm about not letting that happen."

"Right now we cannot successfully evaluate the effects that computers are having on instruction, simply because there's no structure. Nobody knows what to look at," says Andrea Troutman, director of the Florida Center for Instructional Computing at the University of South Florida in Tampa.

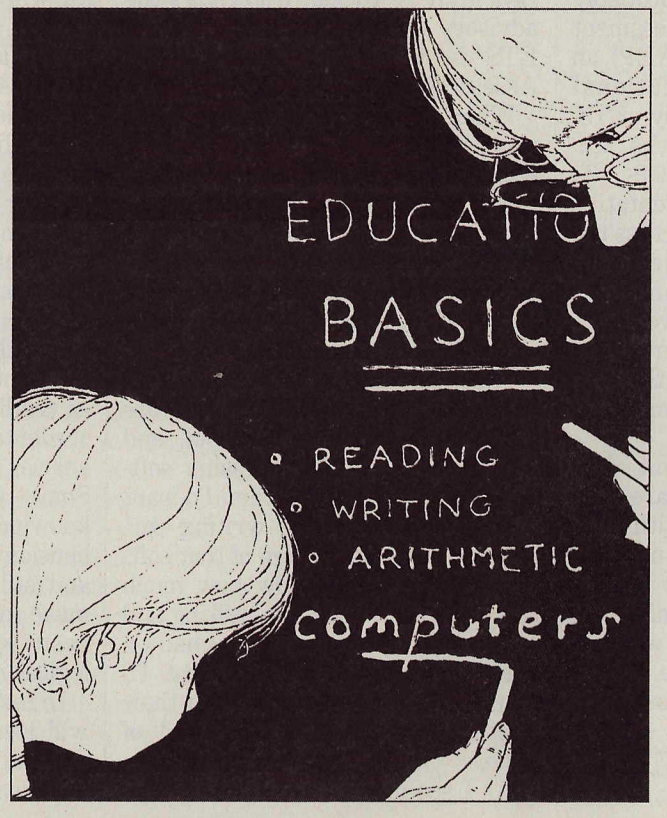


Illustration by David Johnson

Evaluators should also beware of the novelty effects currently associated with computers, says Beth Lowd, computer education coordinator for the Lexington, Massachusetts, public schools. "Kids are competing with each other for computer time, and there's a lot of enthusiasm because it's still so new," Lowd explains. "Before we can evaluate the real effects of computers in classrooms, we need to give the whole thing time to settle down."

But as pupils, teachers, and parents pressure school districts for increases in computing resources, fiscal committees demand proven evidence that computers in the classroom are more than just luxury items. Accountability looms as we seek to expand our application of

computers to the teaching and learning processes.

And with accountability, we face tough questions that plague educational research. First and foremost, we must determine exactly what about computers and learning we want to measure. Are we looking at computer literacy, computer competence, or both? What should each of those terms mean?

Once we arrive at definitions, we must derive testing methods. If the computer is an extension of the human mind, enhancing problem-solving abilities, how do we measure that result—with the use of the computer or without? Finally, we must also look at the repercussions of testing in a classroom situation. When we decide to test for A, schools will begin to teach students to acquire A. Our testing criteria become the curriculum. And it is not clear whether such decisions should be made nationally or locally.

The Shape of Things to Come

The first large-scale data about the national impact of computers on student achievement will probably come from the National Assessment of Educational Progress (NAEP), an ongoing study of educational achievement conducted by ETS. Every year NAEP tests the academic achievement of 90,000 9-, 13-, and 17-year-olds in a representative sample of school districts across the country. Three or four subjects are tested in any given year, and each subject is retested every five years. During 1986, "computer competence" will be tested for the first time, along with mathematics, science, and reading.

The National Assessment data could help evaluators compare computer-related knowledge with kids' abilities and experiences in noncomputer areas. In addition to testing the same students in four different subjects, the Assessment will ask kids and teachers for some critical background information about their school and home environments. Prominent among these will be questions about access to computers, ways that school computers are used, and the time kids spend outside school using computers, playing video games, and watching television. This ought to provide opportunities for many fruitful comparisons.

A national evaluation of computer competence raises some uncomfortable issues. First, how broadly will "computer competence" be defined, and what kinds of objectives will be selected for testing? And what about the testing methodology? NAEP data will be gathered by paper-and-pencil tests (mostly multiple-choice), along with some open-ended questions and essays, according to Archie Lapointe of ETS, NAEP's executive director. But will answers to such questions accurately reflect what students can *do* with computers?

What Is Computer Competence?

"I'm not interested in what kids know *about* computers—things they could tell me from reading a book—but what they can *do* with them," says Marc S. Tucker, who chairs the advisory committee that is helping ETS define test objectives for the Assessment.

When it comes to assessing word processing, for example, Tucker wants to know whether it's helping kids write more effectively—not whether they can answer questions about moving blocks of text or performing global searches. But this involves a rather complex set of questions, Tucker explains.

"First, I'd like to know how many machines are out there, how they are distributed within the school, and what kind of word-processing software they were using. Then I'd want to know whether the writing curriculum takes advantage of that software. I'd want to know how much total time kids spend on writing and how much of that time they had on the machine. Once I knew all that, I'd want to assess the changes in their writing abilities over a period of time."

As I see it, NAEP has little hope of answering such questions. Given its dependence on a one-shot test in which writing skills are not being directly assessed, it's hard to see how it can do more than gather information on what kids know *about* word processing. Still, Tucker is hopeful that the background information to be collected will shed light on some of the connections among computer access, computer knowledge, and effective computer use.

The Problem-Solving Problem

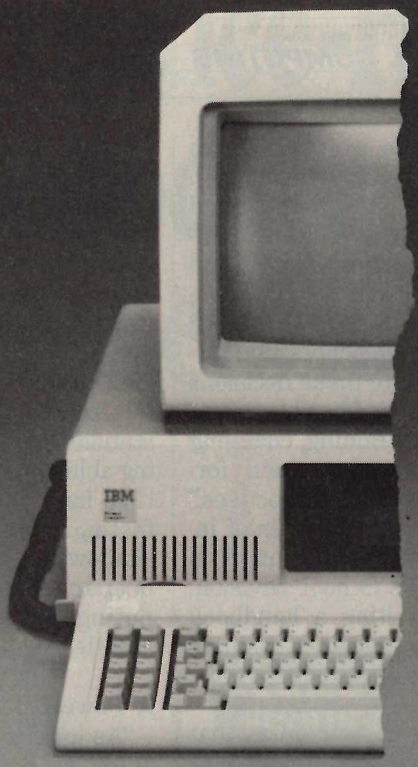
NAEP's emphasis on paper-and-pencil tests limits the kinds of data it can gather in other areas as well. The most important thing to assess is kids' ability to solve problems, says Marc Tucker. "I don't mean using standard techniques to solve familiar problems," he explains. "You want to give kids problems unlike any they've ever seen before and test their ability to put together knowledge from a number of different areas, to see if they can analyze the problems and synthesize the knowledge to solve them."

NAEP's approach to problem solving will probably be a lot less direct. "What we call problem solving involves a combination of processes," explains Sam Messick, a vice president and senior research scientist at ETS who will be helping design the test items used in the Assessment. Solving a particular problem can involve anything from "a relatively simple combination of a few elements to very complex combinations of many of them."

NAEP will attempt to test these different processes separately, much as reading is tested by first having students read a passage and then answer a range of questions about it. Some questions require specific knowledge, others measure comprehension of what the passage is about, and still others test the ability to make inferences based on what has been read and the application of logical reasoning.

In testing problem solving, NAEP will also test students' abilities to generate many divergent responses to a given situation. And still other

Dan Watt is a contributing editor of *Popular Computing*, and author of *Learning With Logo* (BYTE Books/McGraw-Hill, 1983).



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questions will involve what Messick calls "constructive responses—open-ended responses that would be scored judgmentally by panels of trained judges." Still, it's a far cry from the type of assessment Tucker recommends—observing students in the process of solving real problems with or without the use of computers.

Which Comes First?

Educational tests are supposed to reflect what the schools are already teaching. But in the area of computer competence, they could wind up *determining* what the schools decide to teach and how they decide to teach it. "This is the dilemma of any test," says Archie Lapointe. "When you report the results you automatically shape what people perceive as important. Most of us at ETS are violently opposed to any kind of national curriculum. On the other hand, the kind of information we'll provide could be very useful for school districts that haven't yet thought through their objectives very well."

And when the test is a paper-and-pencil test that tries to measure how well kids can *do* things with computers, there's an obvious danger that the schools might decide that the questions themselves embody what they should be teaching. And while no one at ETS or on the advisory panel wants that to occur, Lapointe admits that it wouldn't be the first time that the form of a test had the effect of sabotaging the educational experiences that the testers were trying to evaluate.

"There's a situation that ETS is trying to undo," explains Lapointe. "We've found that we can measure writing ability more reliably using a multiple-choice test than we can by asking someone to write an essay and having two different people grade it." But when ETS dropped essay questions from its writing exams, many school systems and textbook publishers followed suit, according to Lapointe.

If taken with a grain of salt, the data produced by the National Assessment could be very helpful in telling us what schools are doing with computers all over the country and something about what kids are learning about them. Meanwhile, local school districts need timely information about the results of their own programs. "Schoolteachers and administrators need to make decisions about the purchase of hardware and software, teacher training, changing the existing curriculum, and formulating new goals and objectives," says Karen Billings, manager of instructional computing for Houghton Mifflin Company's School Division. So Billings is writing a handbook that should help educators evaluate their own programs in computer education.

Billings points to four areas that schools should be monitoring: curriculum goals and objectives; staff training and development; the use of computer-related materials, including hardware, software, and printed matter; and student progress. And she proposes five methods of gathering data: interviews, observations, questionnaires, analysis of published documents, and, of course, testing. Her handbook will include sample evaluation instruments, which educators can adapt for their own purposes.

In some cases, evaluation can be helpful even before a program begins, Billings says. For example, she suggests that school districts use questionnaires to determine the teachers' knowledge, skills, and concerns before implementing a teacher-training program.

Baffling Dilemmas

Evaluating computer education poses some baffling dilemmas. First of all, the goals and objectives keep changing, along with the technology. Two or three years ago, for example, BASIC was the only programming language taught in the schools. Now thousands of schools are teaching Logo and Pascal as well, although BASIC still predominates. To develop a programming test based on what schools are teaching today we'd have to somehow incorporate all three languages. But how useful will such a test be two or three years from now, when school practices may have shifted even further?

Another baffling aspect of the situation is that many of the most important goals of computer education tend to defy precise formulation and measurement. Despite years of effort, there are no generally accepted standardized tests of problem-solving ability. Creativity is another area that has long defied standardized testing. This will inevitably cast a shadow on efforts to assess the deeper effects of educational computing on students' intellectual abilities.

A Powerful Assistant

"As long as you think of the computer as a *subject*," Marc Tucker says, "assessment is relatively simple. Just like any other subject, the critical problem is to decide how much of what you know about it can be tested with a pencil and paper. But for me, the computer is an extension of mind, an intellectual tool, a very powerful personal assistant. Among schools that have been at this the longest, and working at it the hardest, I think you will find some that are beginning to adopt this view. And it poses some very interesting problems when it comes to assessment."

When she thinks about the long-term potential of the computer, Andrea Troutman has a similar perspective. "Will this tool empower students and teachers in the classroom?" she asks. "Will it extend their intellectual and creative capacities? Will it remove some of the everyday drudgery and give people more time to interact with one another in peaceful ways?"

"The trouble with American educators is that they want to get their planning and experimentation done fast, so that they can evaluate it and report to somebody," Troutman continues. "Right now we need some systematic planning, but I don't think we're ready for evaluation. We've got to learn to live with the questions." □

Prentice-Hall speaks a Commodore language other publishers have forgotten.

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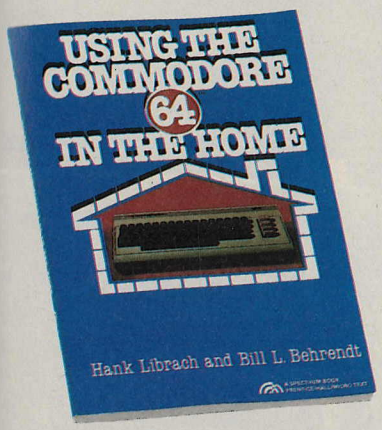

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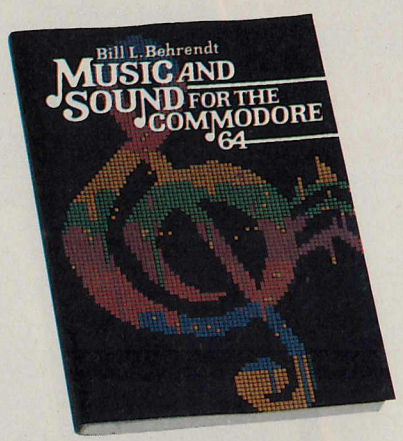

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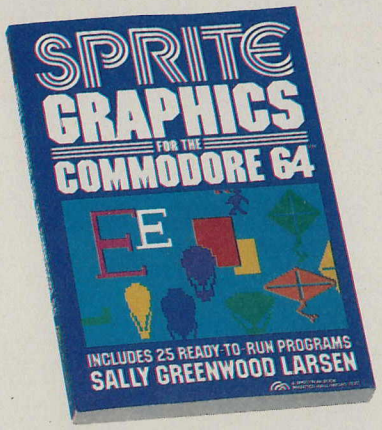

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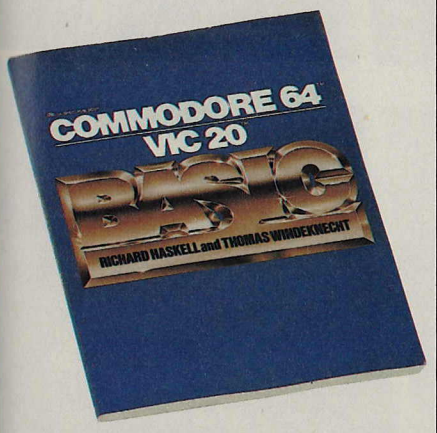

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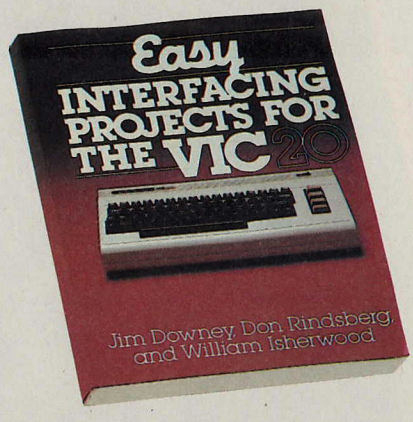

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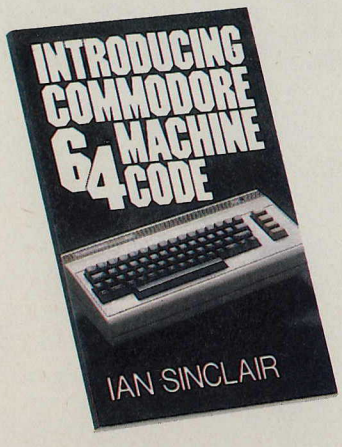

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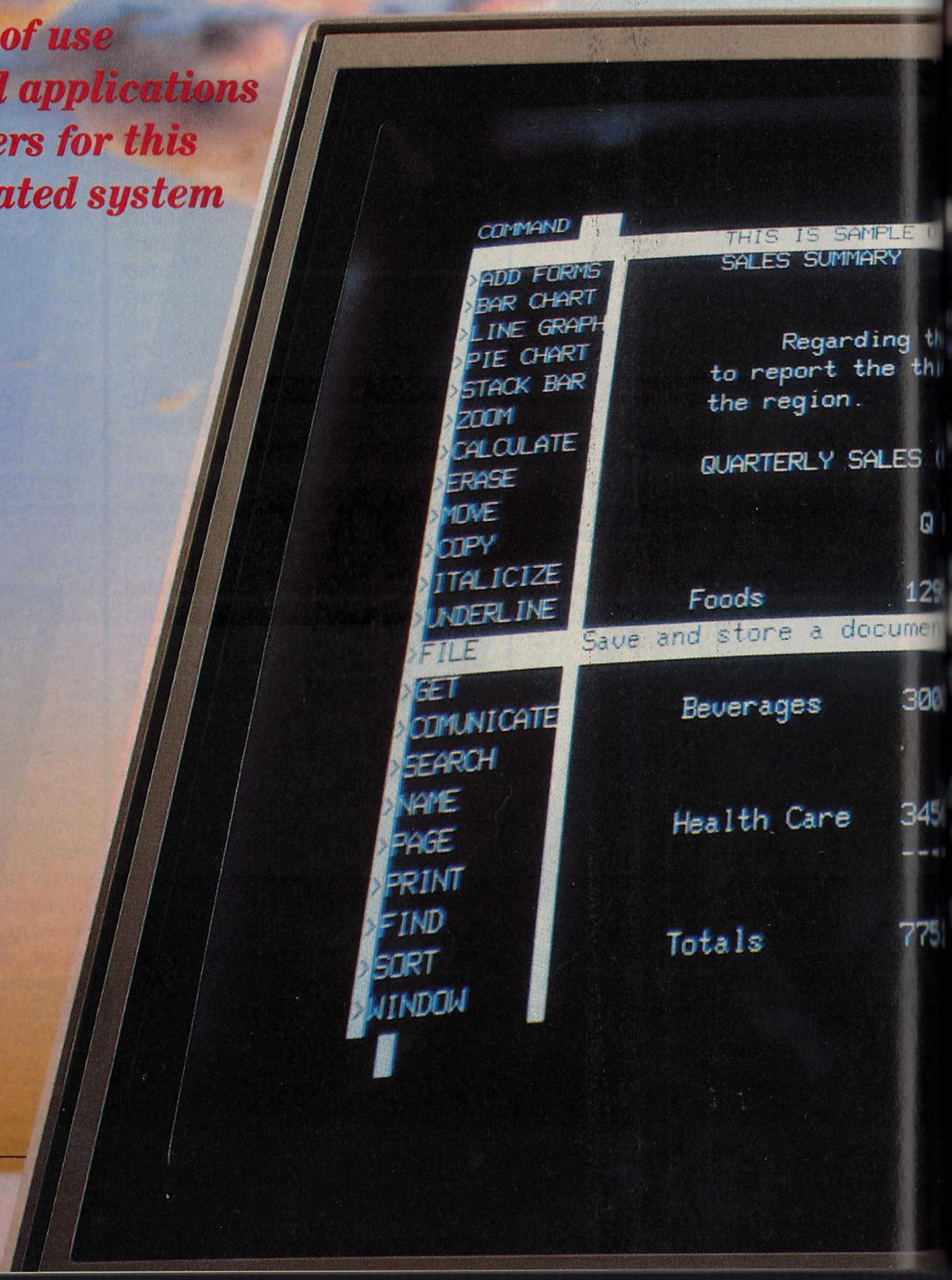
POPULAR COMPUTING
JULY 1984

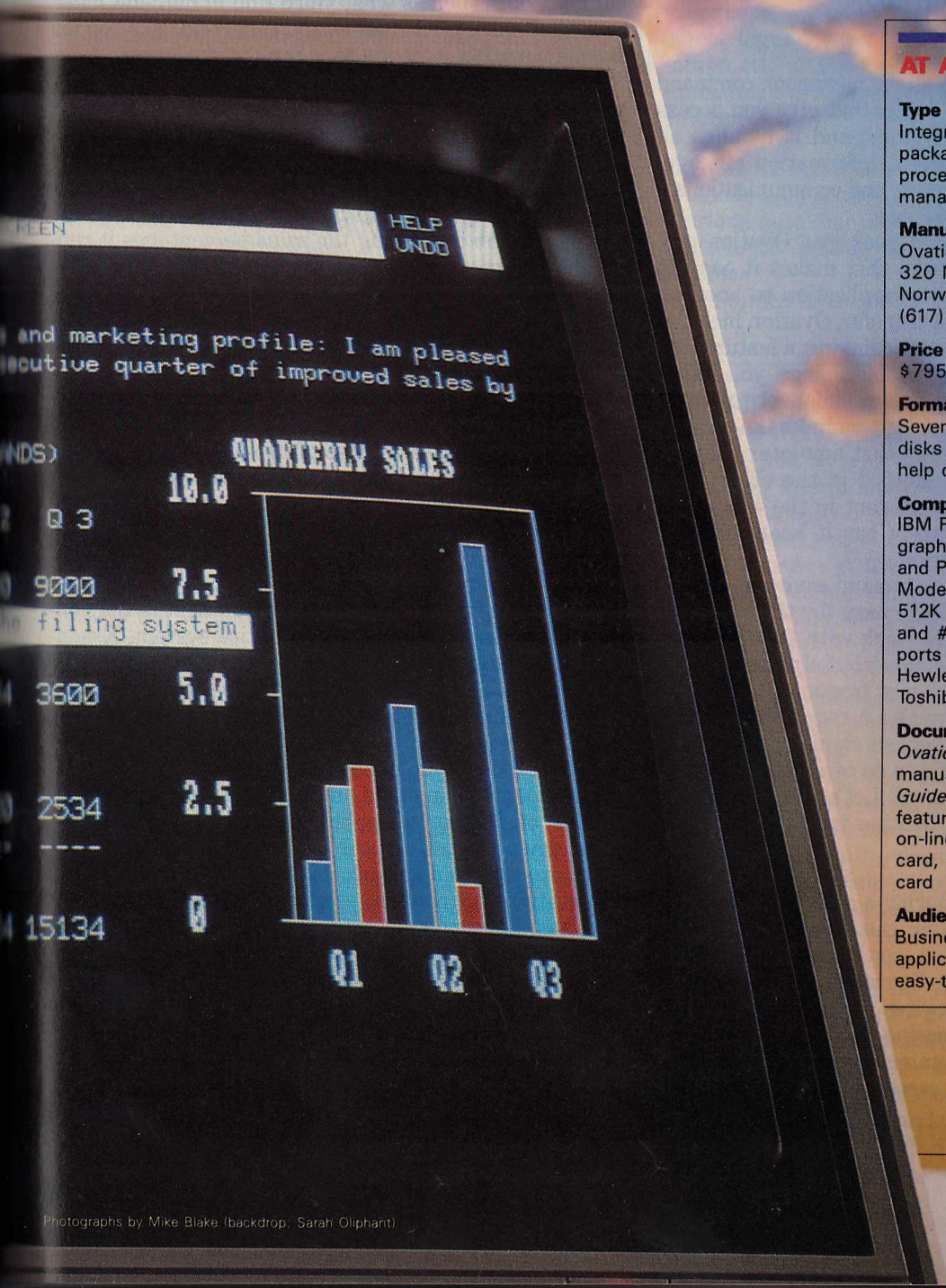
OVATION ARRIVES

Ease of use and balanced applications draw cheers for this new integrated system



COVER STORY by Tom McMillan

When so-called integrated software first hit the market, many who regularly used a variety of business applications felt that their prayers had been answered. Here at last were software systems that would make business computers truly easy to use. But the first round of packages designed to integrate popular applications were not models of easy-to-use software. While now-famous products like Lotus's 1-2-3 and Context MBA are powerful systems that have been eagerly accepted, they still require you to use arrays of nested command menus and to do some tedious cutting and pasting to merge results.



Photographs by Mike Blake (backdrop: Sarah Oliphant)

AT A GLANCE: Ovation

Type
Integrated business applications package including spreadsheet, word processor, graphics, information management, and communications

Manufacturer
Ovation Technologies
320 Norwood Park South
Norwood, MA 02062
(617) 769-9300

Price
$795

Format
Seven 5¼-inch floppy disks (2 system disks with backups, 1 utilities disk, 1 help disk, 1 tutorial disk)

Computers
IBM PC XT (hard disk) with color-graphics adapter, 512K bytes of RAM, and PC-DOS 2.0; Tandy TRS-80 Model 2000 with hard-disk drive, 512K bytes of RAM, and #26-5140 and #26-5141 graphics options; supports Epson, Okidata, Tandy, NEC, Hewlett-Packard, IBM, C. Itoh, and Toshiba printers

Documentation
Ovation Journal (primary user manual), *Ovation Technical Reference Guide*, context-sensitive on-line help features, interactive on-line tutorial, on-line glossary, command reference card, program operation reference card

Audience
Business users demanding balanced applications in a fully integrated, easy-to-use package

Moreover, because these products often use one particular application as a core, they sometimes skimp on the power and consistency of the other applications they offer.

Ovation, a new system developed and marketed for the IBM Personal Computer and the Tandy Model 2000 by Ovation Technologies of Norwood, Massachusetts, seems finally to deliver the ease of use promised by integrated software. Ovation features a common command environment of 26 English words that give you access to all of the system's capabilities, and it handles all functions—spreadsheet analysis, information management, word processing, graphics, and communications—in the same unbroken workspace.

A **COMMON** *command environment gives you complete access to all of Ovation's functions*

Like many other integrated packages, Ovation provides a data-exchange protocol that makes it easy to transfer information from one application to another. But going beyond basic data transfer, Ovation includes what the company calls automatic linking, a feature that updates all data according to any change you might make. If you use figures from a spreadsheet to create a bar graph, for example, the system links the spreadsheet and graph in such a way that any later changes to one are automatically reflected in the other. This capability has always been inherent in the concept of integrated software, but rarely has it been made as unobtrusive as it is in Ovation.

Features like the common command environment and automatic data linking make it easy for the novice to begin performing productive work with Ovation. This is a bonus not only for the beginner but also for the company that has to train new users frequently. The software does not require a week or two of instruction before a new user can accomplish significant work. In fact, almost anyone can begin to do productive work on the system in a matter of hours. Let's look at a typical task to see just how easy Ovation is to use.

True Ease of Use

Imagine that you're preparing a sales report. While writing a paragraph detailing the percentage of total sales achieved by each region, you realize that it would be helpful to represent these figures in a pie chart. With Ovation, you don't have to switch modes or leave where you are in your word-processing document. You select Graph from the common command menu, which opens a space at the top of the screen about one-third the depth of the display. Although something like an on-screen window in appearance, this space is not sharply set off—your word-processing text is still visible and accessible, and essentially you're working in a continuous area (see "Ovation at Work" on page 100).

The Graph command prompts you first to select the type of graph and then to indicate the figures to be graphed. But you don't have to type in the numbers—you simply point with the cursor (using cursor-control keys—the initial version of Ovation does not offer a mouse-guided pointer) to the figures you wrote into your report. Each wedge of the pie chart appears at the moment you specify the percentage it represents. When creating simple graphics like the pie chart we're talking about here, the system recognizes on its own the relationship between the figures you point to. With more complex data such as what you'd find in high-low-close graphs of stock prices, the Graph command asks you for the information it needs to complete the graph.

You're then prompted to indicate where in the text you'd like the chart to appear. Again using the cursor, you point to the upper left and lower right corners of the space you want the chart to occupy, and the image is instantly scaled to fit and then inserted. Say you want the chart to appear within the text margins right beside the paragraph describing the sales percentages it represents. Most other systems would require you to reformat your text manually, in some cases switching back and forth between separate modes or workspaces, but Ovation automatically realigns the text so that it wraps around the chart.

As you can begin to visualize, this flexibility and immediate responsiveness make Ovation a productive tool. I feel that the system's ease of use leads you to refine the appearance and content of your work until it's just the way you want it, in this way discouraging "quick and dirty" solutions.

Common Command Environment

Ovation's common command environment is the central organizing structure of the entire system. Essentially, this single set of 26 "plain English" commands gives you access to all of the functions that are typically included in spreadsheet analysis, information management, word processing, graphics, and communications. (See "Ovation's Commands" on page 150 for a glimpse of the common command environment; refer to "Capabilities of Ovation's Applications" on page 99 for a breakdown of the features of Ovation's applications.)

Other systems approach this level of consistency and integration, but none has realized it to the extent Ovation has. Visicorp's powerful Visi On, for example, features a common set of commands for its various applications, but these control only generic operations such as manipulating applications windows and transferring data. To access functions specific to a given application, the Visi On user has to go to a separate command menu exclusively for that application. In contrast, Ovation uses the same consistent set of commands for all functions, and the system itself recognizes what application you're

Tom McMillan is an associate editor of *Popular Computing*.

CAPABILITIES OF OVATION'S APPLICATIONS

While in some ways it goes against the spirit of the product, we've pulled Ovation's five applications out of their integrated context to make it easier for you to see how the system measures up. Bear in mind that it is not simply the features listed below that make Ovation what it is, but the way these features are coordinated to work together.

SPREADSHEET
- 702 columns by 10,000 rows; 7 million cells total
- trig, log, natural log, modular, statistical, date, financial, logical, and string functions
- linking of ranges of cells between multiple spreadsheets
- naming of cell ranges for easy manipulation
- multiple font styles, underlining, and extensive formatting capabilities

INFORMATION MANAGEMENT
- 4096 characters per record
- variable-size fields up to 256 characters
- sorting and indexing on two keys
- free-form record design
- protected and computed fields
- number of records per file and number of files limited only by disk capacity

WORD PROCESSING
- soft hyphens, hard carriage returns, word wrap, left and right justification, pagination, insert and overlay settings, decimal tabs
- global find and replace
- headers and footers
- multiple ruler lines
- naming of points in text for quick searching
- on-screen display of italics, boldface, underlining, superscripts, and subscripts
- mail merge with information management

GRAPHICS
- line, bar, stacked-bar, clustered-bar, X-Y, pie, area, stacked-line, high-low, and high-low-close charts and graphs
- user control over grid lines, color patterns, shading, labels, legends, and titles
- automatic or user-controlled scaling
- immediate graphing reflects each number when it's entered

COMMUNICATIONS
- standard asynchronous communications
- various auto-dial modems supported
- automatic dialing and log-on using prestored routines
- communications can be performed as background task

working on and prompts you accordingly.

Thus Ovation does away with the notion of separate applications and renders modes, windows, and other trappings unnecessary. The system integrates applications to the point that what the user sees is one comprehensive, multifunctional program in which the same commands are always in effect and all work is accomplished in the same workspace. Besides simplifying access to the various functions Ovation offers, the clean appearance of the screen makes it easier for the user to relate to the content and design of a document. The screen's uncluttered look is enhanced by Ovation's own special character set and text format.

Working with Common Commands

The common command environment works in a straightforward manner. When you access the command menu by hitting the F1 function key, a vertical list of command names appears along the left side of the display screen. With names such as Get, Move, File, Copy, Graph, Erase, Calculate, and so forth, commands are easy to understand and remember. Moving the cursor to an individual command highlights the name and opens an inverse video band containing a brief description of the command's function.

When you select a command, its name appears to the left of a status line at the top of the display screen and the menu disappears. Help and Undo features are always available via dedicated function keys. Choosing Help calls up a screen with information specific to the command you've chosen, and Undo will cancel the last message you've sent to the computer.

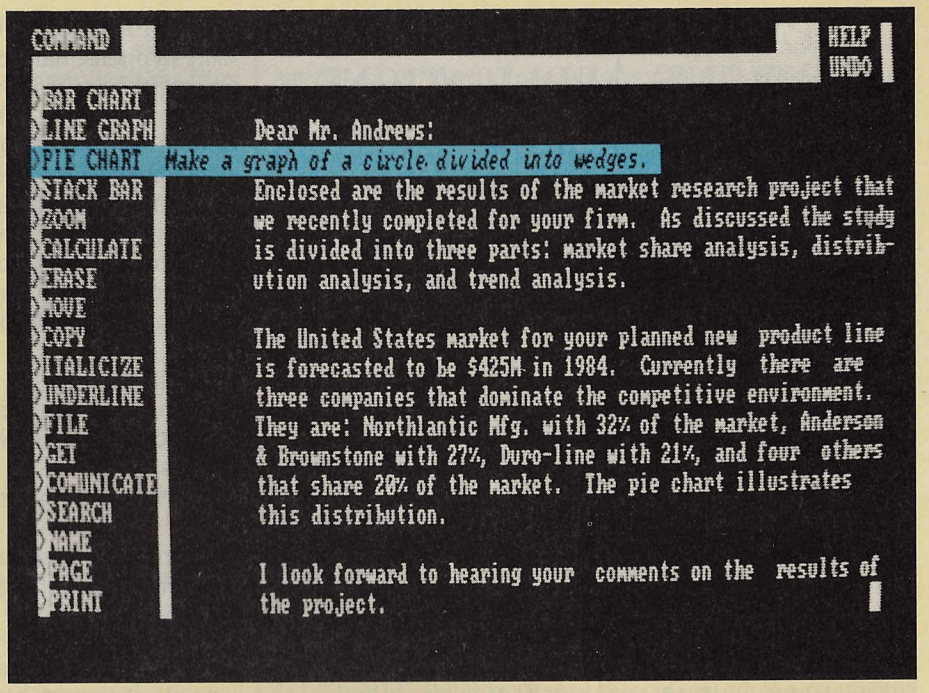
The top line of the display also gives you specific prompts (usually a series of them) for the execution of the command you've chosen. You'll see the sophistication of Ovation at this point, for while the command names are common to all applications, the system recognizes what you're working with at any given time and gives you prompts specific to the task at hand. For instance, if you've called the Move command to move a sentence of text, you're prompted to indicate that sentence by painting it with the cursor. If, on the other hand, you're using the same command to move a graph, all you need to do to indicate the image you want to move is place the cursor anywhere within the graph. The system recognizes the graph as a discrete unit that must be moved in its entirety.

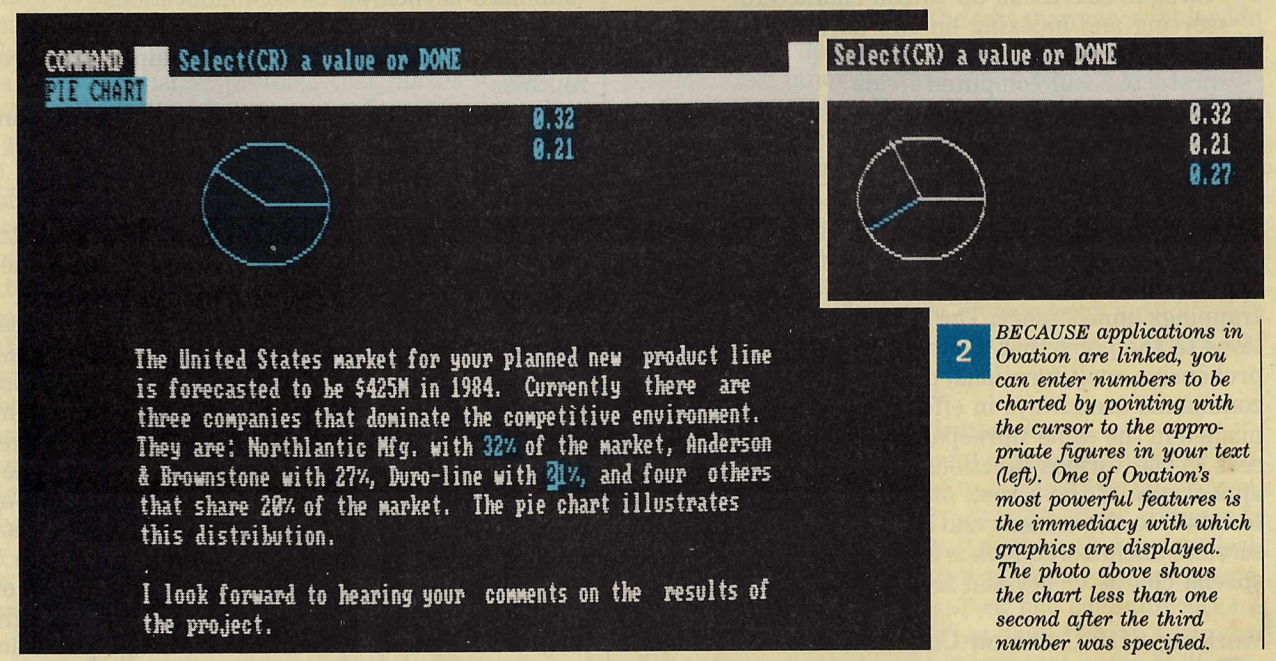
Beneath this intuitive user interface is the intricate system that makes it all possible. In order to give you the assistance that I've described, the Ovation software must track and file every sequence of commands you issue. Rather than asking you to remember what mode you're in and to use the commands appropriate to it, Ovation keeps track of this for you. While the basic concept is simple enough, the software that makes it a reality represents some intricate programming, and the demands placed on your system require some expensive hardware.

OVATION AT WORK

SUPPOSE THAT you're using Ovation to prepare a business letter that you want to illustrate with a pie chart. Hitting the F1 function key calls up the command menu seen in this photograph (right), and pointing with the cursor to the desired command opens a reverse-video description of its function (highlighted here for emphasis). In the production version of Ovation, all graph functions have been incorporated into one all-inclusive command.

1





2

BECAUSE applications in Ovation are linked, you can enter numbers to be charted by pointing with the cursor to the appropriate figures in your text (left). One of Ovation's most powerful features is the immediacy with which graphics are displayed. The photo above shows the chart less than one second after the third number was specified.

Automatic Linking

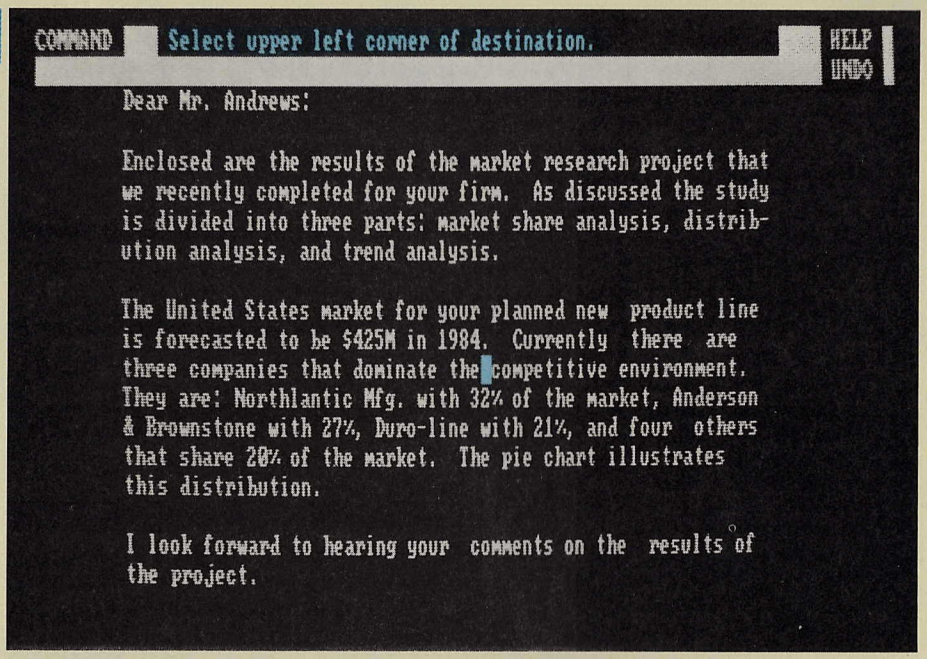
The system's tracking of your commands is the technical basis for Ovation's ease of use. However, it does more than just relieve you of the need for keeping tabs on what application you're using and what set of commands is operative.

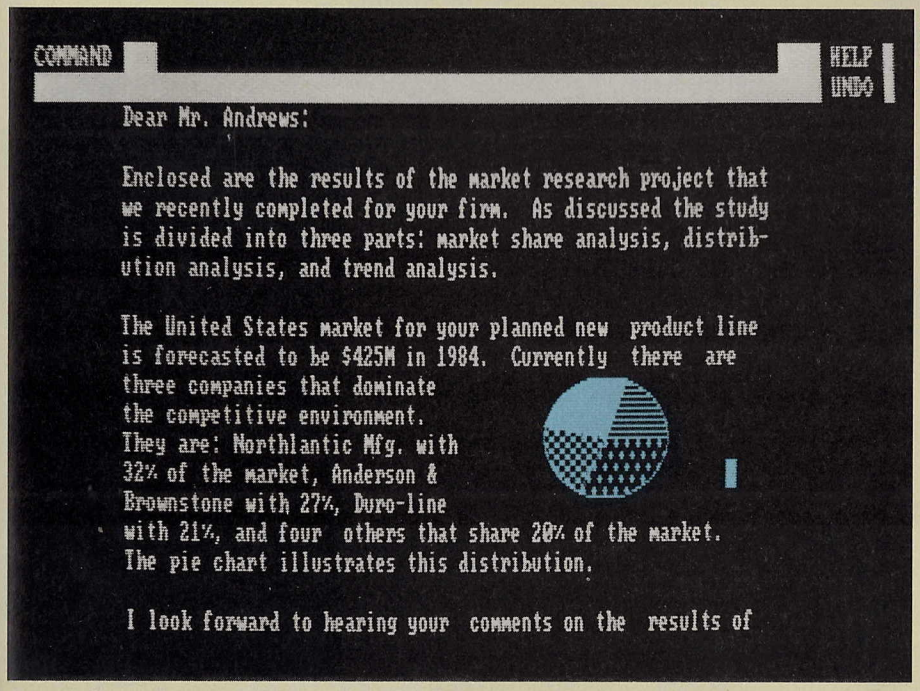
Because the system stores as a part of your document file the total sequence of keystrokes you enter, it is able to link the various aspects of your work automatically. The software uses its record of your commands and input both to determine whether any updates are necessary and to perform the recalculations such updates require. This means that when you create a chart by pointing to numbers in a spreadsheet or a paragraph of text, your chart is automatically linked to those numbers; when you change the values in the spreadsheet or text paragraph, Ovation automatically alters the chart to reflect the new numbers.

An analogy will help you understand the power of Ovation's automatic linking. When working with an ordinary stand-alone spreadsheet program, you know that the software records the formulas determining the relationships between rows and columns in your spreadsheet. When you make a change in one cell, others are auto-

ONCE THE pie chart is complete, you are prompted to indicate the "destination" where you want the chart to appear. As you'll note from the prompt and the position of the cursor (highlighted in the photo on the right), you can indicate a point anywhere on the screen, even in the midst of text. In the next step you specify the lower right corner of the area you want the chart to occupy, thus establishing its final size.

3





4

AS SOON AS you've indicated the desired location of the chart, Ovation automatically scales it to fit, realigns the text to clear a suitable space, and inserts the chart in your document just as it will appear when printed (left). Given a modicum of familiarity with the system, you should be able to complete the entire procedure illustrated here in well under one minute.

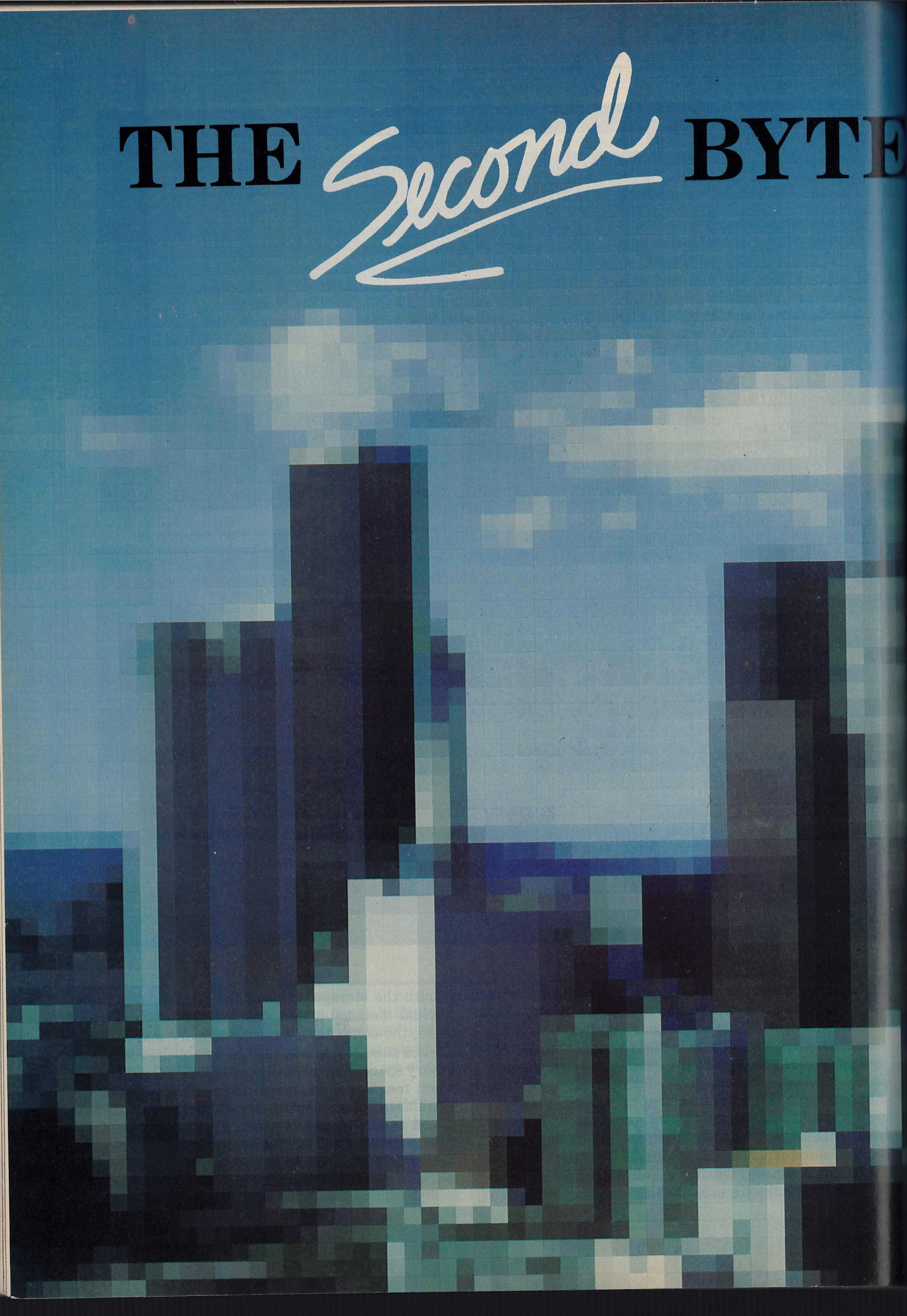
matically recalculated according to these stored formulas. In Ovation, this recognition of the relationships between data extends to *any* document file. What this means for the Ovation user is that the ability to handle projected changes, for which spreadsheets have been so justly praised, is found in word-processing, graphics, communications, and database applications as well.

If you think this sounds like a lot of record keeping and recalculation for the system to administer, you're right. These responsibilities assumed by the system are the main reason why Ovation requires a hard-disk drive and why the software uses a virtual-memory design to optimize the storage space of the hard disk.

Virtual memory means that, as far as you're concerned, the computer's internal memory and its hard-disk data storage function as if they were one continuous memory space. Theoretically, a single file could contain several megabytes of information. What happens beneath this uniform interface is essentially that your data (as well as the system's records of your commands) is organized by "pages," with each page being of a size that will fit into the computer's memory. The system automatically moves the appropriate page into the com-

CONTINUED ON PAGE 149

THE *Second* BYTE



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If you're closer to Los Angeles than to San Francisco, come to our *second* BYTE Computer Show, in June. If you're closer to San Francisco, we're holding our *third* BYTE show there for you, in September. Why so many BYTE Shows? So that BYTE and Popular Computing subscribers don't have to travel too far!

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POPULAR COMPUTING

McGraw Hill

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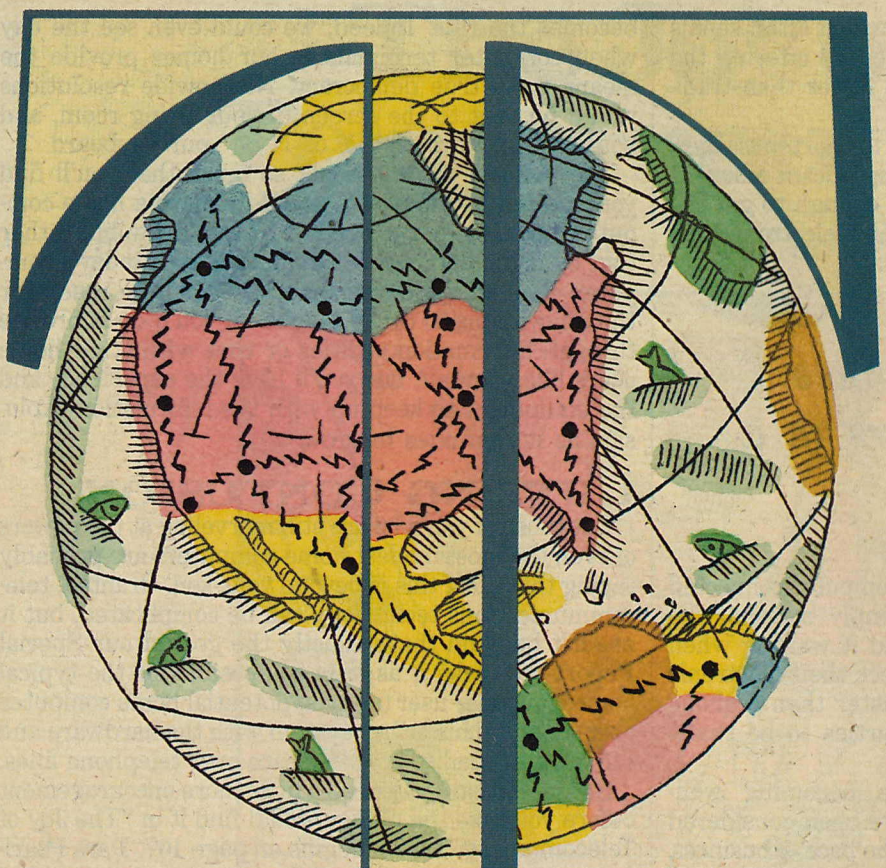

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PART THREE

BUYER'S GUIDE TO COMMUNICATIONS SOFTWARE ..... PAGE 121

COMMUNICATIONS SOFTWARE COMPARISON CHART ..... PAGE 126

T IS FOR TELECOMMUNICATIONS

The reasons why we should add communications to our computers' capabilities have been enumerated so often that you probably know them by heart. Once we've equipped our machines with telephone modems and communications software, we're able to search on-line databases containing information on thousands of subjects; exchange ideas and software with other computer users; get up-to-the-minute news, travel information, and stock prices from commercial services like The Source and Compuserve; and even shop and bank from the comfort of our own homes.

While this is all well and good, many of you may feel that you can do without such conveniences, at least for the time being. Perhaps you feel that the computer applications you're already working with provide plenty to keep you busy. But I'd like to present several even more compelling reasons why telecommunications is one of the most practical and beneficial applications of personal computer technology. All you have to do is look at two of today's most notable social trends and consider where they are taking us.

As anyone with even a bit of awareness about recent history can see, we have become a highly mobile society just in the past few decades. Indeed, we have reached the point where it's often quite difficult to get in touch with the person we need. Sometimes it seems that the more urgent your communication, the harder the contact is to make.

Little by little, technology is offering solutions to this problem. Belt-borne beepers interrupt movies and dinners, and cellular radio systems have put telephones in

Illustrations by Phillipe Weisbecker Handlettering by Jim Parkinson

cars. Even the U.S. Postal Service, which often seems a bastion of tradition, has capitulated by offering the E-COM service that is many times faster than traditional methods of delivery.

Most of these advances are geared to short messages, however. The only way to transmit significant amounts of information (short of being lucky enough to get the person on the phone) is via one of today's electronic mail

COMPUTER
terminals in our homes could make us voters in a true democracy

systems. Typically using a personal computer connected to standard phone lines, senders simply transmit the vital information, and receivers find it waiting when they use their own computers to check their electronic mailboxes. It's as fast as or even faster than a phone call, and it doesn't require both parties to be ready simultaneously.

Electronic mail capabilities are becoming well-established, but until now, they have been considered something of a luxury. However, as the pace of business, industry, and the need for information continues to accelerate (as it seems certain that it will), those without the access to electronic mail that computer communications systems provide might as well be living in houses without telephones. Even if you're not in dire need of the conveniences that electronic mail offers, this burgeoning technology will undoubtedly affect your way of life.

A second trend that is beginning to make telecommunications capabilities de rigueur touches all of us on a more fundamental level. It has always been a struggle to stay informed about the political and social choices that affect the quality of our lives, but with information exploding all around us since the advent of small computer systems, it has become nearly impossible to keep up with it all. Computer access to on-line databases covering the news, legislative records, governmental reports, and laws that inform an educated citizenry are beginning to emerge as the only way to go. Granted, you can still keep up by reading a good newspaper and listening to the broadcast news, but as the interest in and need for specialized areas of focus grow, so too does the value of the rapid, customized access to information that computers provide.

Moreover, imposing the will of informed citizenry has become less and less of a personal affair. Written petitions are already being replaced by more efficient, and often more effective, networked computer questionnaires. For the time being, those who are using computer communications in advocacy roles are ahead of the game, but it won't be long before this way of organizing becomes the rule. Indeed, we could even see the day when computer terminals in our homes provide the means for a true democracy. Nationwide resolutions would be sent to the screen in your living room, and you'd vote by pressing Y or N on your keyboard.

The point of all this is not so much that you'll find yourself left in the past if you don't have a home computer linked to your phone line by tomorrow, but rather that by using and becoming familiar with today's computer communications technology, you'll be ready for the innovations to come. Maybe all you'll do is browse through information utilities or chat with other home users like yourself, but you'll have the experience and the equipment to keep up with the information explosion as it continues to grow.

CUTTING CONFUSION

But those of you who are still marveling at the powers of even the most modest home computers are probably saying that all of this is beyond your ken. Granted, telecommunications technology can be complicated, but it needn't be. And that's exactly the goal of our Special Report—to make it as easy as possible for the typical home computer user (or even potential home computer user) to equip his or her system with the hardware and software needed to communicate over telephone lines.

But just in case you need a little more encouragement before you take the plunge, you'll find it in "The Joy of Telecomputing," which begins on page 107. Dara Pearlman takes you on a tour of the ever-growing world of telecommunications services, filling you in on the advantages and pleasures of electronic mail, on-line conferences and chats, software exchanges and game networks, and databases storing volumes of information.

Next, we'll get down to the more serious business of selecting the components of your telecomputing system. "Buyer's Guide to Modems" on page 111 gives you a clear path to follow as you grapple with all of the specifications that describe the various models on the market today. "Buyer's Guide to Communications Software" on page 121 tells you all the right questions to ask to make sure that you end up with the communications package that best suits your own needs, and the "Communications Software Comparison Chart" that follows presents the details of some of today's most popular products.

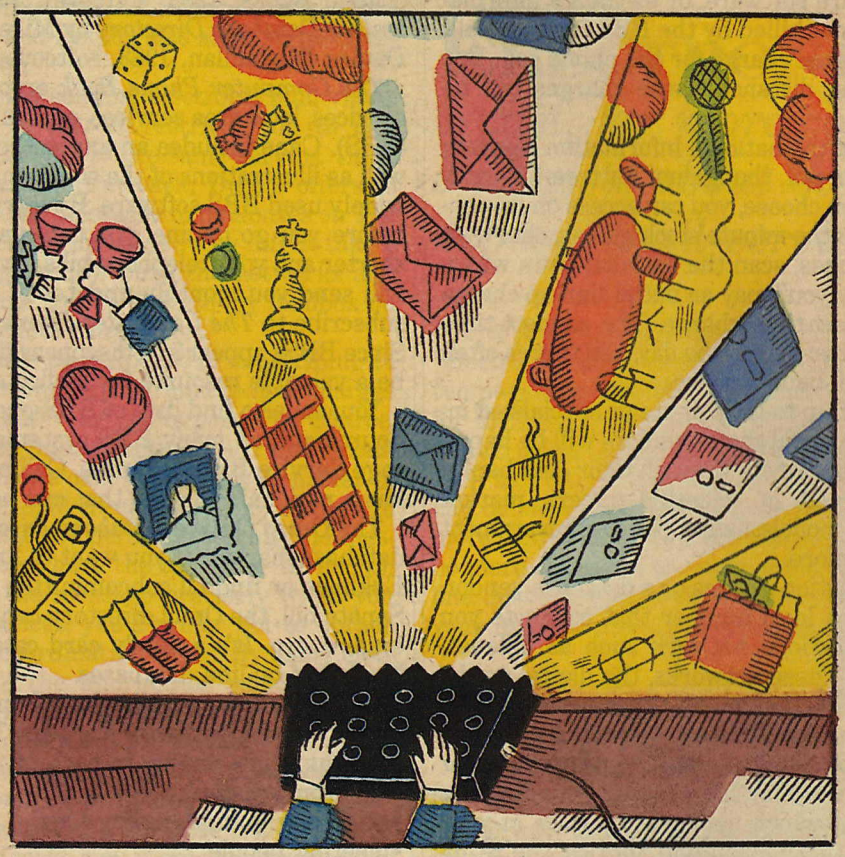
Nestled among these major offerings you'll find two shorter pieces that help to round out the picture. "The Case for 300 Baud" suggests that increasing the speed of communications can reach a point of diminishing returns, and "Megamodems of the Future" looks at the current development of tomorrow's technology.

And last but not least, we invite you to turn to page 174 for an in-depth review of three of the best-selling communications software packages on the scene. Armed with all of this information and prepared with the buying strategies outlined in this report, you will be able to approach your computer dealer with the confidence that you know just what you're after.

—David B. Powell

The Joy of Telecomputing

Everything you need to know about going on-line at home



SPECIAL REPORT

by Dara Pearlman

THERE'S A VAST new world waiting to be explored, and you don't even have to leave home to get started. All you need is a personal computer, a modem, communications software, and a telephone line. A sizable credit limit on your Visa or Master Card wouldn't hurt either. (Well, no one said that exploring would be cheap.) Along the way you can meet people who share your interests, discover new ideas, get free software, play games, look up abstracts from scientific journals, get stock market tips, make airline reservations, and go shopping.

Hundreds of computers across the country, ranging from personal computers to large mainframes, will answer your computer's phone call. If you dial up another micro, chances are it's a free "bulletin board system" (BBS) operated by a computer hobbyist or perhaps by a business such as a computer store that gains customer goodwill by providing this public service. If you can get through (lines to well-known bulletin boards are often busy), you can read messages posted by other callers, share software, or exchange information. You're usually not billed by the BBS for your call; you pay only the normal charge for the phone call. But if you're calling long distance, those charges can be substantial.

The mainframes of the national information services will also answer your call, though not for free. Depending on the service you choose, you can access on-line encyclopedias, see up-to-the-minute stock quotes, chat with other users, play games, scan the national news wires, or send mail. Usually you'll pay an initial sign-up charge and an hourly connect-time charge. The connect-time charge is usually higher during the day, and there's often a surcharge for 1200-baud service.

If you're in need of up-to-the-minute or specialized information, hundreds of database vendors will be happy to sell you the right to browse through their data banks. You can find abstracts of scientific papers, market studies, econometric models, lists of patents, government reports, and much more.

To reach an information service or a database vendor, you'll probably dial a local number that connects you to a data communications network such as Telenet, Tymnet, or Uninet. These networks, the digital equivalents of Sprint or MCI, transmit computer data at lower cost than the long-distance networks designed primarily for voice communications. If you don't live near a network number, you may have to pay long-distance charges. (To find out which networks operate in your area, write or call the information service you're interested in; addresses and telephone numbers of the major national and local area information services are listed on page 156.)

Many information services, such as Compuserve, Delphi, Dow Jones, and The Source, include the network charges in their hourly connect-time fees. Others, such as Electronic Information Exchange System (EIES) and Dialog, bill you extra for network charges—about $3 to $4.50 per hour in the evenings and $8.50 to $9.50 per hour during the day.

Besides these national information systems, you'll find local systems designed to serve limited geographical areas. Some are free, such as Buy-Phone, an electronic Yellow Pages of West Los Angeles. Others have a connect charge, such as Gamemaster of Evanston, Illinois, which features on-line computer games. In addition to the connect charges, if any, for the local area systems, you'll have to pay long-distance phone charges if you call from out of the area.

Dara Pearlman is a contributing editor of *Popular Computing.*

Starting Out

As you can see, the cost of roaming around this immense on-line territory can be hefty, so you'll want to avoid aimless wandering. Indeed, you can easily get lost among the dozens of national information services and local area services, hundreds of bulletin boards, and hundreds more specialized database services. Fortunately, road maps are available to help you find your way. Two fine ones are *The Computer Phone Book* by Mike Cane (Plume Books, 1983, softcover, $9.95) and the *Omni Online Database Directory* by Mike Edelhart and Owen Davies (Macmillan, 1983, softcover, $10.95).

The Computer Phone Book emphasizes information services, local area services, and bulletin board systems (BBS). Cane includes an annotated listing of BBSs, as well as illustrations of the commands used by the most widely used BBS software. By learning to use a system before you go on-line, you can make your BBS visits shorter and your telephone bills lower. In addition, Cane will send you monthly updates of the directory if you subscribe to *The Computer Phone Book Update* ($20). Since BBSs appear and disappear daily, the updates can be a valuable resource for dedicated on-line explorers.

You can also find lists of BBS phone numbers on The Source and on many BBS systems. The People's Message Service BBS in Santee, California, (619) 561-7277, has a national BBS list that can help you get started.

The *Omni Online Database Directory* focuses on the database market. If you want to know the latest about Eskimos or find all subcommittee actions on a certain Senate bill, the Omni directory can help you find it, and scads more. It's a handy card catalog to the growing library of on-line databases.

With these two guidebooks in hand, what can you look for on your expedition of discovery? You'll probably find something interesting in each of the following areas:

- electronic mail
- attending on-line conferences
- meeting people
- exchanging software
- playing games
- finding information
- shopping and banking.

Let's look at these one by one.

Sending Electronic Mail

Not too long ago, I sent a manuscript to a friend for comment and review. His office is 30 miles away, so I dropped the envelope into my corner mailbox, trusting that he would receive it within two or three days and get back to me with his suggestions. No such luck. Two weeks later, he had still not received the manuscript. I drove another copy to an express mail service, which guaranteed next-day delivery.

I had a very different experience after I bought a modem and subscribed to The Source, one of the major information services. The Source provides every subscriber with an "electronic mailbox," an area of disk

storage in its central McLean, Virginia, computer installation. Your "address" is your Source account number. Any fellow subscriber who knows your account number can send mail to your mailbox, where it waits until you call up The Source and check your mail.

This time I asked a different friend, one who subscribes to The Source, to read a manuscript. It took me five minutes of connect time to send the article to his mailbox, and I had his comments back the next day—a vast improvement. Other national information services, such as Compuserve and Delphi, also allow subscribers to exchange messages.

The main limitation of sending electronic mail via an information service is that it restricts you to correspondents who subscribe to the same service. In an attempt to overcome this drawback, Delphi offers to send overnight electronic messages to mailboxes on The Source and Compuserve. Actual delivery might take a bit longer, depending on how busy the networks are. When I sent a message from Delphi to my mailbox on The Source, delivery took three days.

Why go to the trouble and expense of subscribing to an information service and paying connect-time charges to send electronic mail? Why not bypass The Source, for instance, and send mail directly to a friend's computer via a normal phone call? It's mainly a matter of convenience. Sending mail directly from computer to computer requires that the person receiving the message be home or at least have the computer turned on and ready to accept the message precisely when you send it. In most instances, you'll prefer not to bother with scheduling and coordinating times. By using electronic mail on one of the information services, both parties can send a message or check their mailboxes whenever it's most convenient for them.

Suppose you want to send high-speed mail to someone who doesn't subscribe to a computer information service? It can be done. Several services will put your message on paper and make sure it gets delivered quickly. For instance, both The Source and Delphi can route your messages through the U.S. Postal Service's E-COM (Electronic Computer Originated Mail) service. If you subscribe to Compuserve's Executive Information Service, you can send E-COM messages via Compuserve's Infoplex system.

When you use E-COM, your message travels electronically to a Serving Post Office (SPO) near its destination. Then Postal Service employees print it on paper, put it in a blue E-COM envelope, and send it on its way as first-class mail. E-COM messages, which can be no longer than two pages, are usually delivered within two days. The Source charges $1.35 for the first page of an E-COM letter (41 lines) and $.25 for the second page (64 lines). Delphi charges $.72 per E-COM letter or as little as $.52 per letter if you use a special set of procedures to compose it.

To reach a lot of people quickly with the same message, you might want to send Western Union Mailgrams via The Source. The charges depend on how many messages you send. For example, you'll pay $5.15 for a single Mailgram of 100 words but only $3 per Mailgram if you send the same 100 words to more than 100 people. According to The Source manual, Mailgrams you send before 4 p.m. (EST) are "virtually guaranteed next-day delivery anywhere in the U.S. and Canada."

MCI also offers an electronic mail service. MCI Mail options (for the first three pages) include same-day delivery ($25), overnight delivery ($6), delivery via U.S. Postal Service ($2), or electronic delivery to the mailbox of another MCI Mail subscriber ($1 for the first "electronic ounce," equivalent to three to five typewritten pages; each additional ounce costs $1). To sign up for MCI mail, call (800) 624-2255.

ELECTRONIC *mail is fast, far more convenient, and costs about the same as express mail services*

Such prices are competitive with express mail services such as Federal Express or the Postal Service's next-day delivery service. And electronic mail can be a lot more convenient—no more stamp and envelope licking, no more dashes to the post office, no more standing in line. Just dial your favorite information service and send your express messages electronically.

ATTENDING COMPUTER CONFERENCES

Would you like to compare notes with other parents, talk about founding a new religion, get ideas on how to debug your latest program, or discuss some other topic that concerns you? You could have another bull session with your friends, but are you curious about what strangers might have to say? If so, you might like to take part in a computer conference, where you can share ideas for the price of a phone call or of information service connect time.

Two kinds of on-line conferences are possible: delayed time and real time. The delayed-time conference has a lot in common with electronic mail. To participate, you send your ideas to a single, shared mailbox, where others can read what you have written and where you see their contributions. Unlike a live discussion, a delayed-time conference gives you plenty of time to ponder what the other conferees say and then compose your reply. In contrast, a real-time conference is more like a conference telephone call. All members are on-line at the same time. When one member types in a comment, all the others see it on their own display screens.

You can join a delayed-time conference using an information service or a bulletin board system devoted to conferences. For real-time conferences, you'll have to use one of the national information services.

Real-time computer conferences, like face-to-face meetings, have to be arranged in advance so that all the participants can be present. Compuserve often schedules such conferences for its Special Interest Groups (SIGs). For instance, the IBM Personal Computer SIG had a real-time conference on how to use the PC-DOS Debug utility. SIG members saw the meeting advertised for several weeks in advance whenever they signed on to the IBM PC SIG.

Delayed-time conferences have a more flexible time frame. A lively discussion can go on for months as new contributors join in and add new ideas. An example of delayed-time conferences is The Source's Participate section. Here subscribers can share ideas on topics like "telecomputing in the classroom" and "Apple stock, battered or bolstered?" In addition, The Source has a celebrity electronic-lecture series that has featured contributors like John Naisbitt, author of *Megatrends*, and Congressman Ed Markey (Democrat, Massachusetts), a leader of the nuclear freeze movement. If you join one of these conferences, you can read what the experts have to say, then respond with ideas of your own.

Another information service, Electronic Information Exchange System or EIES (pronounced "eyes") is devoted almost entirely to delayed-time conferences. Sponsored by the New Jersey Institute of Technology, EIES is the most academically oriented of the on-line conferencing systems. You can find discussions of literary, scientific, and philosophical issues. The price for the home user is rather steep, however; EIES costs $75 per month, not including network connect-time charges, which run about $9.50 per hour.

Perhaps the most economical way of sampling a delayed-time computer conference is by dialing a local bulletin board system that specializes in conferences. These systems, often called conference trees, are usually limited to one caller at a time, so you might encounter a lot of busy signals before you get on-line. When you do sign on, you'll see a list of ongoing conferences and a menu of commands that let you read the discussions and add your own thoughts.

When I called up a conference tree BBS near my home, I encountered a lively discussion on how to start a new religion, tips on playing adventure games, and my favorite, a thoughtful analysis of "holistic computing." The first contributor asked whether computing could be "holistic," that is, an intuitive activity in which the whole is equal to more than the sum of its parts. He worried that the rise of computers would make people "feel dehumanized and bored when forced to live as replaceable cogs in a system" and asked whether a "humanistic computer model" could be found that would "empower people with the technology instead of enslaving them with it."

Four other callers contributed original and thought-provoking comments, and then the discussion ended, except that there was room for me to add my ideas. This open-ended quality is perhaps the most intriguing aspect of electronic conferences. There is no conclusion to the discussion, as you might expect at a lecture presented by a "lecturer" to an "audience." Instead you find an opportunity for each caller to step out of the audience and take a turn at the lectern.

Meeting People

Computer dating services have been with us for years. Just fill out a questionnaire and the computer finds a list of possible dates whose answers match yours. Now the proliferation of personal computers has added a new wrinkle. You can use your modem to call a "Dial-Your-Match" bulletin board system, fill out the questionnaire on-line, and ask the BBS to make you a match.

BBS questionnaires are often funny, and they're sure to ask some pretty personal questions. For example, one Dial-Your-Match BBS asks:

How Would You Rate Your Appearance?
- *A. a real fox/totally hot!*
- *B. very attractive*
- *C. good looking*
- *D. average looking*
- *E. not too bad looking*
- *F. an ugly lookin' sucker*

How Intellectual Are You?
- *A. I have deep intellectual curiosity and read, study, observe, or philosophize often*
- *B. I have written many books and technical journals*
- *C. I graduated in the top 20% of my class*
- *D. I'm a mad scientist*
- *E. Just an average Joe*
- *F. I have every issue of* The National Enquirer

Once you complete the questionnaire and ask for a match, you can browse through other questionnaires on the system, send messages to other users, or post a public message. The public messages can be very steamy—like some of the advertisements in the underground press. In one matchmaking system I called, the messages were a mixture of personal computer classified ads and invitations for intimate rendezvous. One warning: don't call a Dial-Your-Match system if explicit language offends you.

If you want to meet others in a less structured setting, you might try Compuserve's CB Simulator, which is a lot like an electronic cocktail party, with people wandering from room to room, striking up conversations with strangers. The action is liveliest in the evening, when several hundred people may be jumping from channel to channel, chatting via their keyboards.

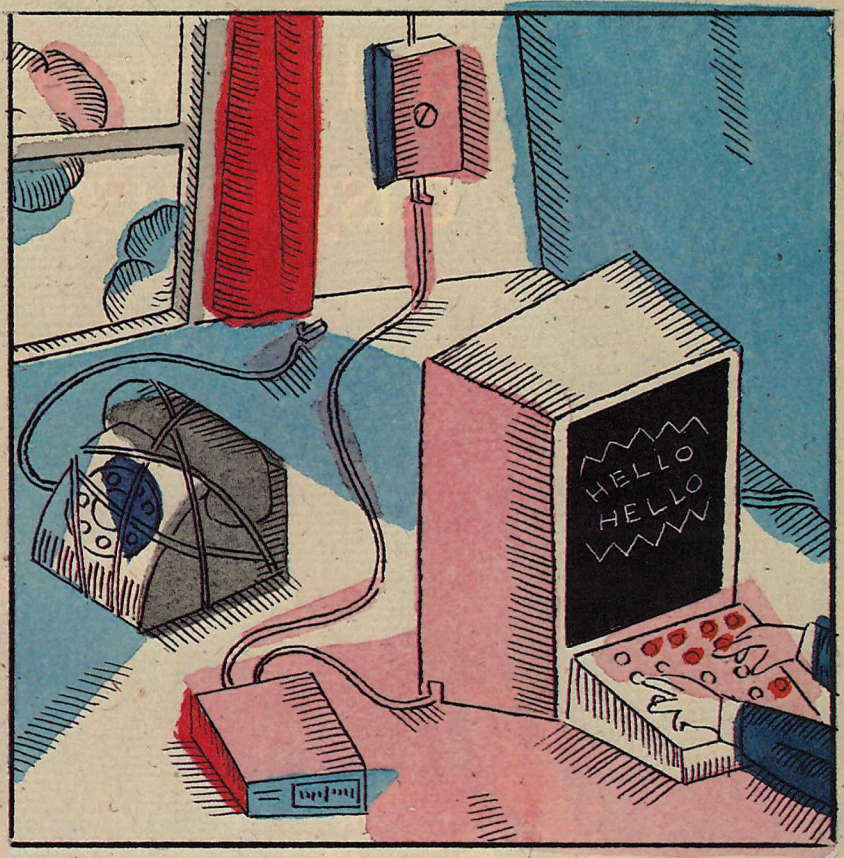
Delphi also offers the chance for subscribers to strike up group conversations. Delphi calls this feature Conference, but it's more like Compuserve's CB Simulator than a computer conference because the interaction is usually casual. The Source lets you chat on-line with another subscriber but not in group conversations.

If social chit-chat bores you and if Dial-Your-Match doesn't attract you, you can still find kindred spirits in the on-line world. Perhaps you can locate a BBS serving people with your interests in your locale. Many bulletin boards specialize in news and advice for computer owners, but you can also find BBSs devoted to other topics, such as medicine, real estate, religion,

CONTINUED ON PAGE 152

Buyer's Guide to Modems

Knowing what to look for simplifies product selection



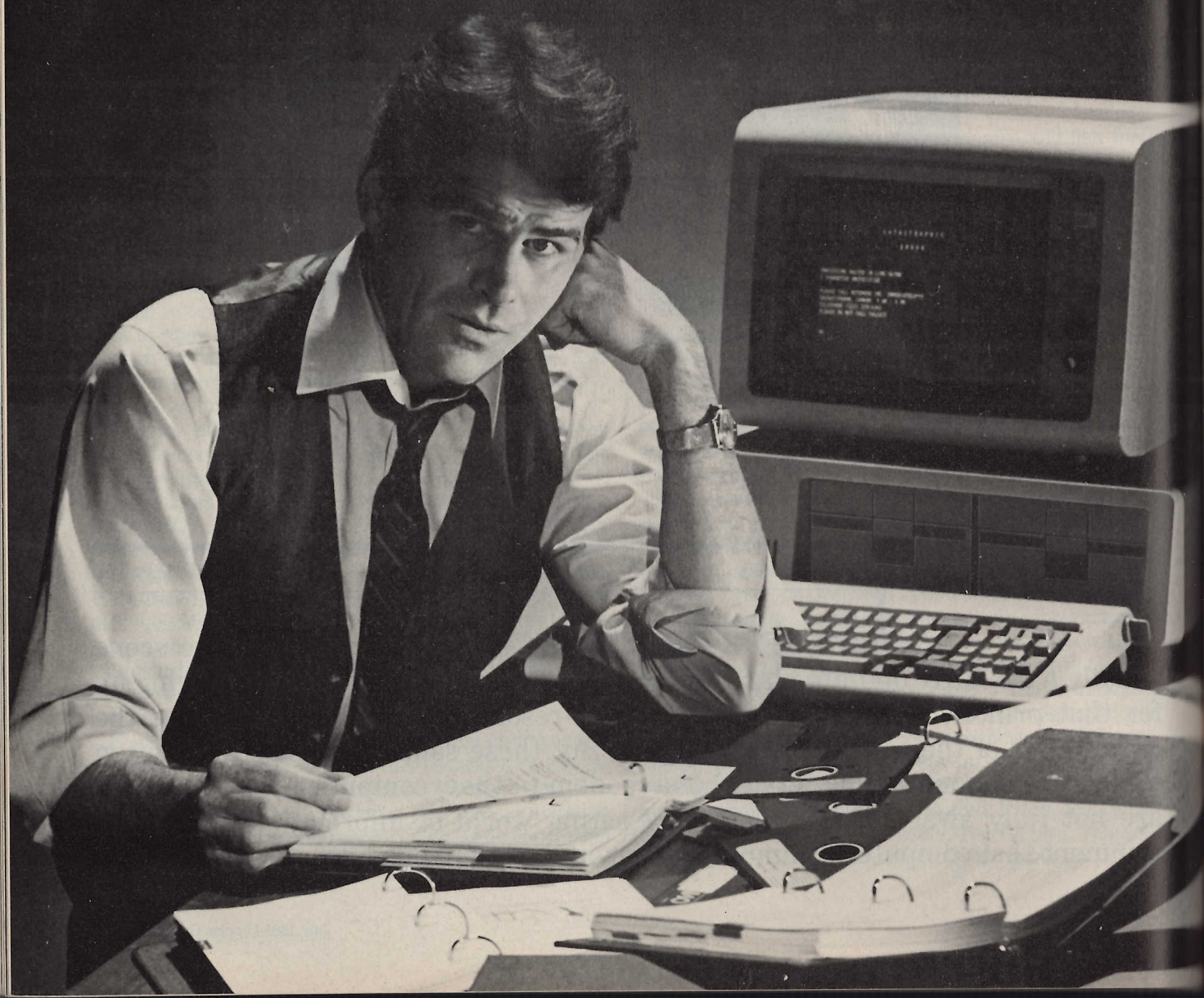
SPECIAL REPORT

by David B. Powell

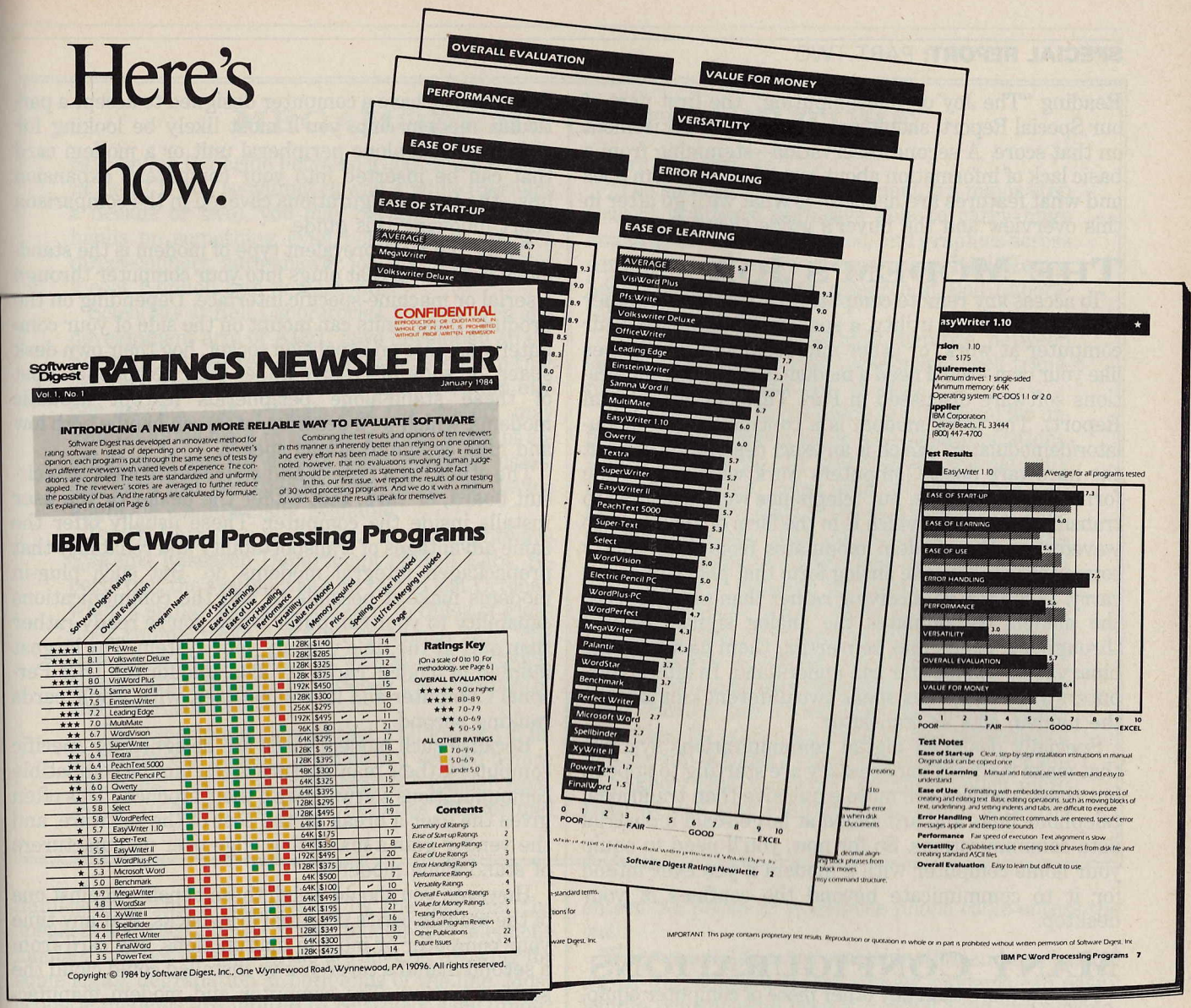
THOSE HOME COMPUTER owners new to the scene usually have fairly definite plans for expanding their systems. They're saving up for that printer, second disk drive, or high-resolution monitor to enhance the capabilities of their new digital delights. But these same enthusiasts are often less certain about adding a telephone modem to their computers. Perhaps they are not fully aware of the vast and exciting world of information and entertainment that computer communications via the telephone lines can bring them.

"I don't have time to fool around with computer mumbo jumbo.

How can I find software that's <u>really</u> easy to use?"



Here's how.



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SVSI

Reading "The Joy of Telecomputing," the first part of our Special Report, should provide plenty of enticement on that score. A second reservation—stemming from a basic lack of information about just what a modem does and what features are needed—is what we'll go after in this overview and the buyer's guide that follows.

THE MODEM'S JOB

To access any remote computer installation—whether it's an information utility, a specialized database, your computer at work, or other microcomputers in homes like your own—you'll need a modem (and the communications software discussed in Part Three of our Special Report). The word modem is a contraction of "modulator/demodulator," which is an exact description of what the hardware does. Computers work with data in the form of binary pulses, but telephones were designed to transmit voice data, which is in the form of analog audio waveforms. The modem modulates (converts) binary computer data into the analog form that phone lines can carry. When you're receiving rather than sending data, the modem demodulates the analog signals coming through the phone line, converting them back into the binary form a computer can understand. In effect, computers and telephones speak two different languages—the modem acts as translator.

Specially designed digital communications systems that make modems unnecessary are starting to appear, but these services are more expensive than traditional telephone links and are aimed at large-scale industrial data communications. So for now, you'll need to equip your home computer with a modem if you ever intend for it to communicate beyond the confines of your desktop.

MANY CONFIGURATIONS

Perhaps more than any other piece of computer equipment, modems come in a boggling variety of configurations. When you're considering which modem to buy, your first concern should be with the ways the various products are configured and how these might fit with your existing (or contemplated) computer system.

Some computers—especially portables like the Radio Shack Model 100—include their own modems and basic communications software packages. Such arrangements are especially valuable to peripatetic computer users who always need to have their modems along for the ride. Also, because these modems are actually chips integrated by the manufacturer into the main circuit board of the computer, they are usually easier to use and somewhat more reliable than separate peripheral units from a different manufacturer. And don't forget the universal benefit of getting the entire system from one company: there's no question about accountability when something goes wrong.

However, many of these integral modems do not offer the range of capabilities that add-on products do. Unless you especially need the transportability of such a configuration or have a computer designed to accept a particular modem chip, you'll most likely be looking for either a stand-alone peripheral unit or a modem card that can be inserted into your computer's expansion bus—the two configurations covered in the comparison chart following this guide.

By far the most prevalent type of modem is the stand-alone peripheral that plugs into your computer through a serial or machine-specific interface. Depending on the product, these units can mount on the side of your computer, plug into an expansion socket, hog their own desk space, or slide discreetly under your telephone. Most of these stand-alone peripherals (except acoustic modems, which we'll describe later) can handle both low and high communications speeds.

The other main type of add-on modem comes on a circuit board, or card, that either the dealer or the user installs inside the computer. These usually offer the same advantages of transportability and reliability that prepackaged integral modems do. But such plug-in modems make it possible to add the communications capability to your computer when you're ready rather than only at the time you buy your system. The largest number of modem cards are available for the IBM Personal Computer and its compatibles, with Apple cards ranking second.

Because such modem cards are designed for specific computers, their manufacturers can bundle compatible communications software with their products. This often gives the user a break on the cost of the software, and the vendor gets a marketing edge over manufacturers of stand-alone modems.

However, you should weigh these benefits against one of the modem card's potential drawbacks. If at any time your computer or modem malfunctions, any card from a second manufacturer you've installed could cloud the service picture. The computer and modem manufacturers might claim the bug resides in the other company's product. Even a well-intentioned vendor could have trouble isolating problems when more than one manufacturer is involved.

THE CONNECTION

If you decide on a modem card, it will connect directly to your telephone line. But if you opt for a stand-alone modem, your next decision is between acoustic and direct-connect models.

Acoustic modems are the older technology. The user connects with the telephone line by pressing the telephone handset into rubber cups on the modem. Data travels from the computer into the modem, and then into the telephone handset and over the telephone lines to a remote computer. Incoming data follows the same path in the opposite direction.

Because physical sounds have to travel between the modem and the telephone, the acoustic process seems rather mechanical. This tenuous link also means that your communications can be muddled. For example, if you touch or move the modem, the resulting sounds could travel through the modem and garble the com-

David B. Powell is a freelance writer based in Winchester, Massachusetts.

MEGAMODEMS OF THE FUTURE

Still trying to decide between a 300- or 1200-baud modem? If you're willing to wait a while (perhaps a decade or two), you may be able to get your hands on something even better. How about a direct-connect, auto-answer job that zips along at a cool 1 billion bits per second?

Scientists at Bell Laboratories, the research and development arm of AT&T, have developed an experimental laser telecommunications system that can transfer data at speeds of up to 1 billion bits per second. Lab officials feel the system may eventually be used to deliver a wide range of sophisticated new services to home computer users, but they will not speculate on when the device might be commercially available.

Byron Kasper, a researcher in the Lightwave Systems Research Department of Bell Labs, reports that the system was first tested last October, when a signal was sent through 75 miles of glass fiber thinner than a strand of human hair. The transmission was conducted without any electronic amplification equipment between the transmitter and the receiver.

"The experiment showed that 1 billion bits of information can be sent 75 miles in 1 second before the signal has to be regenerated," Kasper says. "After 75 miles, the signal becomes weaker and errors can crop up."

"The success of this experiment is a major step toward lightwave highways able to carry huge amounts of voice, data, video, and graphics across continents and under oceans," says Paul Henry, head of optical systems research at Bell Laboratories.

"The longer the allowable distance between signal boosters, the more economical such transmission systems will be," he says.

But in addition to providing the potential for unprecedented levels of large-scale communications, such a system has the potential for dramatically expanding typical home uses. It would most certainly reduce the costs of the sort of services home users enjoy today while at the same time bringing now uneconomical services into the realm of possibility. For instance, the extremely high speed of transmissions would make it feasible to link home computers to a central library service that would rapidly download complete books or, in a lighter vein, to an entertainment service that could offer movies like those now stored on videocassettes. So while you revel in the convenience and the fun of today's telecommunications technology, know that tomorrow promises much more than we can now even imagine. —John Edwards

munications. This is aggravated by the fact that the speakers and microphones in both modem and telephone handset may not be state-of-the-art devices, allowing for some signal degradation at both ends of the line. Most acoustic modems are limited to relatively slow (under 300 baud) communication speeds in an attempt to minimize such transmission errors.

Another vexing little problem with acoustic modems might not occur to the buyer until it is too late. The rubber cups in most acoustic modems are round, but many modern phones no longer fit this shape. Even if you can get a sleek handset into the acoustic modem cups, the fit might not be perfect. Any extraneous sounds that slip in could botch your communications.

Also, because acoustic modems transmit computer data through exactly the same channel as voices, you'll have to remove and reinsert the handset to switch between data and voice transmissions. This can prove inconvenient when you want to discuss data transmissions with someone on the other end of the line.

However, if your communications needs are simple and limited to modest amounts of data only, the acoustic modem offers a well-established, inexpensive alternative to full-featured direct-connect devices.

Direct-connect modems, on the other hand, completely bypass the telephone handset. Instead, they plug into the telephone's circuits—either where the handset cord enters the phone or where the phone cable enters the wall.

Without outside noise contamination and mechanical signal degradation, direct-connect modems can easily handle transmission speeds to 1200 baud and beyond. And, because they free up the handset, you can usually switch between voice and data transmissions quite easily. With some modems you do this by pressing a switch, while other units can sense the difference between voice and data and switch automatically. Even more sophisticated modems don't need to switch at all—by allocating voice and data to different telephone-line frequencies, they let users talk and exchange data simultaneously.

Modems offering high-level capabilities such as automatic sensing of voice versus data signals are referred to generically as "smartmodems." These contain their own microprocessors that coordinate the sophisticated features they offer. As far as current technology goes, they represent the state of the art.

SPECIALIZED MODEMS

Within the scope of this article it is impossible to cover all of the companies manufacturing modems or all of their products. For that reason, we have concentrated on those units that are most suited to the home user. This excludes various special-purpose modems such as those used for communications over direct links for short

distances, those that add binary-data communications capabilities to internal PBX phone systems, and those high-speed units that include password security and other business-oriented features. But even within our narrow scope, you'll encounter a wealth of available features. The following section introduces you to these features, and the chart lists their availability in terms of specific products.

BASIC FEATURES

The columns at the left of the chart detail specifications that all modems share. The names and model numbers of the units and their suggested retail prices are self-explanatory (you'll find manufacturers addresses listed separately on page 117), and we've already discussed the concerns of configuration (stand-alone—S/A on the chart—or plug-in card) and line connection (acoustic or direct-connect). Moving across the chart to the right, you'll find the following:

WITH A *full-duplex modem, the text you send is echoed back for display on your screen*

Interface—This indicates the way the modem interfaces with your computer circuitry, which will determine whether a given model will work with your machine. As you can see, the majority of stand-alone modems use the common RS-232 serial interface that is compatible with virtually every modern microcomputer. However, there are several varieties of RS-232 interfaces that differ for the most part in terms of the cables and connectors they require, and you should check the absolute compatibility of a particular modem's serial interface with your computer's serial port.

Modems configured as plug-in cards typically have more specific interfaces that limit them to smaller ranges of computers. Most of these are IBM PC-compatible or Apple-compatible. Such card-based modems will save desk space and often provide greater reliability and convenience.

Dialing—This column on the chart specifies whether the modem will dial the phone for you and, if so, whether it accommodates pulse dialing (traditional circular dial), Touch-Tone, or both. NA in this column indicates that the modem requires you to dial the number yourself—less convenient, but quite workable.

Baud Rates—This is the measure of the speed with which a given modem can transmit or receive data. Without delving too deeply into the complexities of file-transfer protocols, parity, start and stop bits, and other details of the technology, we can say with only slight oversimplification that baud rate is basically the number of bits (binary digits) transmitted per second.

A given modem's baud rate depends on the phone-line protocol (set of rules for organizing data) that it uses. Protocols are not listed on our chart because essentially your only real concern with them is the resulting baud rate. But you should be aware that Bell 103 and 113 are the standard 300-baud protocols, while Bell 202 and 212A are the most common 1200-baud protocols.

For home telecommunications applications, you will have to decide between 300-baud and 1200-baud operation or select a modem that offers both. With a 300-baud modem, you'll be able to send or receive roughly 30 to 40 characters per minute; 1200-baud modems will quadruple that rate. Modems supporting the faster rate are more expensive, but because you can in some cases get the information you want in a shorter period of connect time, you may save money in the long run. Communications at 300 baud are entirely adequate, however, and if your plans are modest, a 300-baud modem may be your best choice. For further consideration of this issue, see "The Case for 300 Baud" on page 160.

Communications Modes—Modems operate in half-duplex mode, full-duplex mode, or offer both. Half-duplex modems, which are becoming increasingly rare as the technology advances, will handle communications only in one direction at a time. Full-duplex modems enable computers to communicate in both directions at once and provide the convenience of having the text you're sending "echoed," or displayed, on your own screen. Most of the modems on our chart will handle either mode, giving you greater flexibility.

Data Format—In any home application, you're going to be using an asynchronous data format in which information goes across the lines in irregular spurts. This demands so-called start and stop bits to isolate discrete characters. Faster (and more expensive) synchronous modems have been excluded from our chart because they are intended for more specialized communications in large-scale business installations.

Voice/Data Switch—This feature, which about half the modems on our chart offer, lets you tell the modem to suspend data transfer so you can speak to someone at the other end of the line. In many cases, such as connecting with information utilities or on-line databases, there will be no one at the other end of the line to talk to, but if you intend to communicate with others like yourself, this can be an invaluable feature. The chart indicates whether a modem offering a voice/data switch requires you to make the change manually or has the smarts to recognize the difference and switch automatically.

AUTOMATIC FEATURES

Beyond the basics covered above, different modems offer various automatic features that enhance their capabilities. As you'd expect, the least expensive products offer little or nothing in this category. Other modems do not come with automatic features but can be upgraded through software (such software-generated automatic features are marked with asterisks on our chart). The

automatic features you'll most want to consider include the following:

Auto-Answer—This rather common feature means that the modem can answer incoming calls and receive data without your presence at the computer keyboard. This digital version of the telephone answering machine is especially useful for applications such as call-in bulletin boards, which must remain open around the clock.
Auto-Dial—The other side of the auto-answer coin, this feature enables the modem to place calls on its own using numbers stored in the computer's or, in some cases, the modem's memory.
Auto-Redial—An auto-redial modem will respond to a busy signal by dialing until the number rings.
Auto-Log On—If you select a modem with this feature, you'll be able to program your system to supply the requisite log-on information for whatever remote system you're accessing. This will save you quite a bit of tedious typing every time you log onto an information utility, database, or other commercial service.
Protocol Detect Switch—Modems with Y in this column on the chart are able to detect the protocol requirements of an incoming call and automatically set their own parameters accordingly.
Dialing Directory—Many auto-dial modems will store a directory of numbers that you call frequently, giving you a simple menu to select from.
Number Chaining—An extension of the auto-redial feature, number chaining enables you to program your system so that it will respond to a busy signal by dialing an alternate number or numbers.
Answer-back Strings—Modems with this feature will automatically respond to incoming calls by furnishing programmed identification codes and screen messages.
Line-Sound Monitoring—Implemented in a variety of ways, this feature means that the modem can recognize and report on sounds or signals that indicate the progress of a call, such as dial tones, rings, busy signals, human voices, carrier signals, and so on. Depending on the modem, you receive reports via LED indicator lights, on-screen messages, or audio speakers.
Self-Test—Many modems are able to check the reliability of their own electronics and the telephone interface as well as the accuracy with which characters are entering the telephone line. Modems offering any such capabilities earn a Y in this column on the chart.
Line Test—Modems with this feature are able to test the readiness of the telephone line itself by transmitting test data to the remote system. This data is "looped back" to your modem, and if it is identical with what was sent, you're given the OK to go ahead with the actual transmission.
Bundled Software—Communications software included in list price.

We could go on listing automatic features, but to help you focus on the most important choices (and to keep our chart to a manageable size), we'll draw the line here. Certainly this should give you plenty to go on as you begin shopping for your new modem. □

CONTINUED ON PAGE 158

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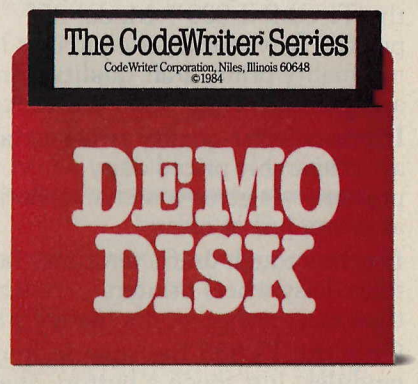

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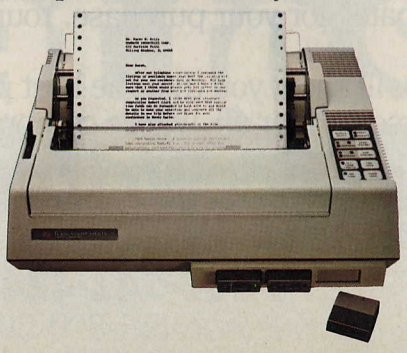

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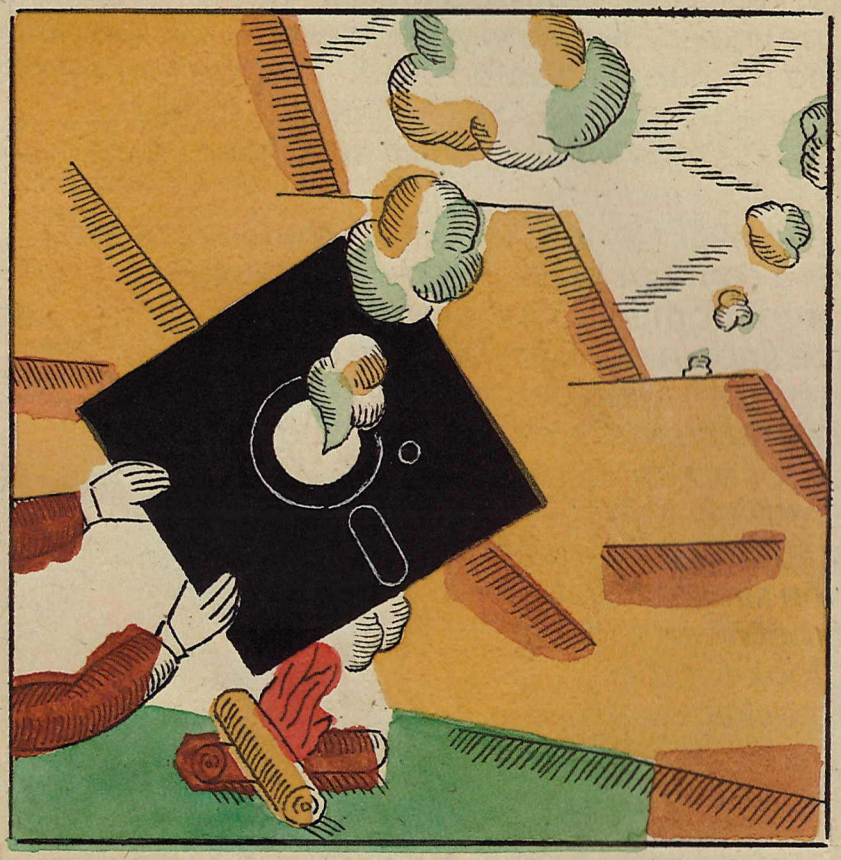
BUYER'S GUIDE TO

Communications Software

Orderly consideration of features will simplify your shopping



SPECIAL REPORT

by David B. Powell

TELECOMMUNICATIONS OWES ITS soul to software—a modem can link your machine to your telephone, but it's communications software that makes computer-to-computer interchanges possible. So which should you select first—the modem or the software? Certainly you shouldn't buy a modem before you have some idea about the software that's right for you. It usually isn't difficult to hook up a modem to your computer; unless stated otherwise, most modems have standard serial interfaces that are compatible with all modern microcomputers.

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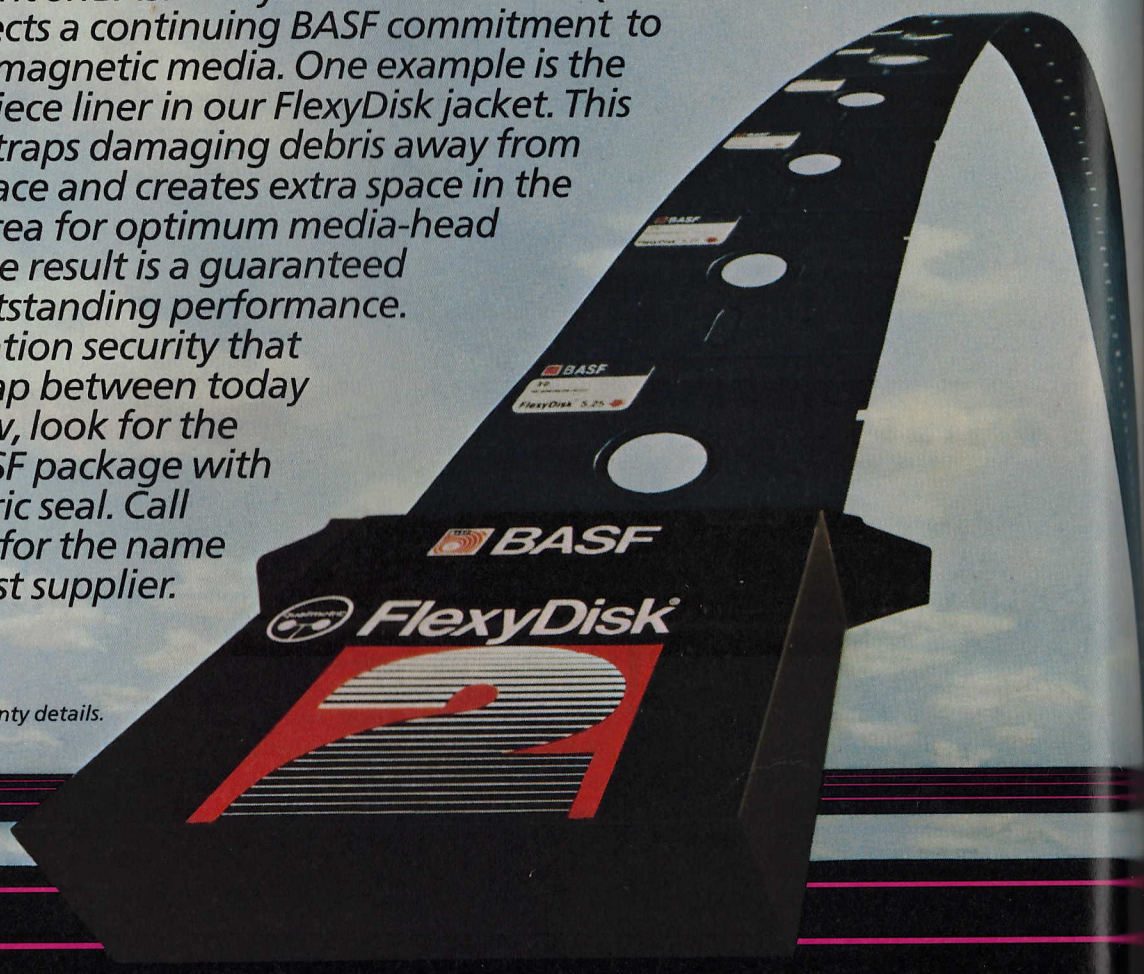

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When you're putting together the ingredients for communicating with remote computer systems, it's wise to think about both the hardware *and* the software that best suit your applications before you make any decisions. Indeed you may find it best to select your software first.

What if your computer already includes its own communications software? Many of the newer portable machines incorporate both modems and communications software, but these generally handle only lower-speed (300-baud) communications. Also, the software you get in such packages tends to cover only bare-bones capabilities, such as setting word lengths and parity bits. To get higher communications speeds and easier-to-use, more powerful software, you'll still have to go shopping. Some operating systems (such as CP/M) also offer very basic communications routines, but these too will prove inadequate for most serious applications.

Another road to a complete communications system is the "bundled" package marketed by a number of modem manufacturers, especially those who sell modems configured as plug-in circuit cards. In many of these instances, you can get substantial price breaks on top-of-the-line communications software packages, but don't be tempted just because it's a bargain. Be sure the communications program you'll be getting is really what you need.

First Things First

Assuming you're shopping for your first communications software package, you'll find it easiest to tackle the major considerations first. Making these decisions will narrow your range of choices, and then you'll be able to zero in on the best product by taking your time to examine the finer points.

Make your first cut by considering the software's compatibility with your computer's system. This means more than just the ability to run a given package on your machine. You'll want to ask whether a communications package will run on the specific version of your specific operating system.

Next, consider whether the software package can translate incoming data files into a format your applications software will accept (or, whether your applications programs include interfaces for the communications package you're considering). This type of compatibility becomes important when, for instance, you want to use your word-processing program to edit files for transmission, or when you want to capture, manipulate, and store incoming files. Some communications packages even include their own file-handling routines, but these are still the exception. After considering such applications compatibility, you'll find that your choices have been narrowed considerably.

Related to this consideration is what I'd call applications hardware compatibility. Many communications programs offer interface routines for system peripherals, and these can multiply your system's usefulness immensely. Depending on the software, peripheral interface routines can make it possible for you to:

- automatically store incoming data on tape or disk for later use,
- transfer large data blocks directly from one disk to another without having to funnel them through main memory,
- send incoming data to your printer,
- capture a complete record of your on-line session by printing keyboard commands and responses from the remote system,
- load incoming data into your computer's internal memory, and/or
- retrieve data for transmission from your computer's memory or from tape or disk storage.

Without any such capabilities, about all that your modem and communications software can do is reel off incoming data across your display screen—and into oblivion. (Some modems do include their own buffer memory, but such storage rarely exceeds 10K bytes in size.) So, if you need to do more than just *look* at incoming or outgoing data, make sure your communications package will work with your peripherals.

Protocols

Compatibility considerations cover only your end of the link. When we begin to look at the actual transmission of data, the subject of protocols becomes important. A protocol is simply a set of rules that specifies how a modem or computer organizes and transmits control characters and data. Before buying a modem and software, you should find out which protocols are used by the remote computers you will be contacting and look for communications products that can match them. Call the on-line databases, information utilities, and other commercial services you plan to use in order to determine this information before you buy your software.

Any discussion of protocols can rapidly become bogged down in technical details. But the following list should give you a basic understanding of the software protocols you're likely to encounter:

- XON/XOFF is perhaps the simplest, most widely used protocol in personal computer communications. The receiving computer simply tells the sending computer to "transmit" (an XON character) or "stop transmission until further notice" (an XOFF character). Because most mainframe computers use the XON/XOFF protocol, and because it normally handles communications at speeds greater than 300 baud, this particular system is widely used in business applications and communications with institutional mainframes.
- XMODEM is a protocol you'll see a lot. It's rapidly becoming a standard in the personal computer industry because it's free—its designer, Ward Christensen, has placed the XMODEM protocol routines in the public domain. For this reason, XMODEM has spread rapidly among individual users and user groups and on computers from Atari microcomputers to VAX minicom-

David B. Powell is a freelance writer based in Winchester, Massachusetts.

puters. XMODEM is also found in commercial products like Crosstalk XVI and Perfect Link. The protocol has become especially popular among CP/M users, whose versions handle file transfers with 99 percent accuracy.
- TTY is an older protocol used for low-speed, Teletype-compatible terminals.
- CRC, short for Cyclic Redundancy Check, is a powerful error-checking protocol used mostly by larger computers.
- SNA is IBM's own standard Synchronous Network Architecture for data exchange.

CONSIDERING
your intended applications will help you choose the right software.

- CCITT is the acronym for a French name that translates as International Telephone and Telegraph Consultative Committee, whose data-communications standards are gaining acceptance for international communications.
- Other less widely used protocols have been derived from popular communications products such as Hayes modems and Crosstalk software.

Closely related to protocols in many people's minds are the various networks used for computer communications. If your business or other establishment uses such a network, you'll probably want to be able to gain access to it, which means you'll need communications software designed to be compatible with that particular network. (Home users without these restraints needn't be especially concerned with such compatibility.) A number of communications software products offer compatibility with these widely used networks:

- Telenet, a 9-year-old international network of non-voice lines capable of very rapid communications,
- Prestel, a telephone-line-based British "viewdata" network that some database services use to display information on television sets, and
- Ethernet/XTEN, a business-oriented cable/satellite network standard developed by Xerox.

YOUR PLANS

Once you've checked out software, hardware, and protocol compatibility, you're going to have to reflect on just what you intend to do with the communications capabilities you're adding to your computer system. Part One of our Special Report, "The Joy of Telecomputing" on page 107, details the many appealing applications that home users with modems and communications software can take advantage of. While in most cases you won't be absolutely cutting yourself off from given services by your choice of a communications program, some consideration of the applications you'll be accessing most often could help you zero in on particularly appropriate software packages.

Depending on the product, a communications program may include command routines that simplify logging on to certain services. One of the most convenient software (or modem) features for easing computer communications is support for macro instructions. Macro capabilities let you store complete sequences of commands, telephone numbers, log-on passwords, baud rates, and other parameters for several different commercial services and bulletin boards. This offers two advantages: frequently used services can be accessed with a single keystroke, and internally stored commands can be executed automatically, which enables you, for example, to log onto a database when telephone rates are lowest.

You should also ask yourself what types of automatic features you will need to handle macro-based transactions. The main automatic options include dialing, log-on, and answering. Further enhancements include auto-redialing, number chaining, and answer-back strings. All of these automatic features, which are variously available in the modem or in the communications software, help your computer handle unattended communications, and you'll find detailed discussions of them in "Buyer's Guide to Modems" on page 111.

FINAL CONSIDERATIONS

Now that you've gotten this far, you're ready to find the one communications program that's best for you by considering more specialized—but still important—features. For example, if your communications simply must not contain errors, you should look for error-checking and correction capabilities. Some communications packages interlace your actual data with parity bits and check-sums, which are derived from the data according to commonly accepted rules. If a similar calculation at the receiving end doesn't yield the same results, the data contains an error and is retransmitted.

Another checking technique is the data "echo" used frequently in full-duplex communications. The receiving computer simply feeds (echoes) the data it receives back to the sending computer's display, where it can be compared with the original message.

Some users will also be concerned about the security of their systems and data. Certain communications software packages (and modems) implement a variety of safeguards, including:

- passwords that prevent access until the proper characters are transmitted,
- access controls that forbid certain transactions to certain callers,
- encryption codes, which currently offer the only protection for data that is in transit between computers, and
- call verification, a uniquely active security technique that accepts a caller's ID, hangs up, and automatically returns the call to the authorized telephone associated with that ID.

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Also, if large quantities of data are to be transmitted, telephone-time and connect charges may be a consideration. To help reduce these outlays, some communications packages can compress data by eliminating carriage-return characters, blanks between words, and long strings of identical characters. This can also cut required storage for files by as much as half.

There are bound to be a few available features that I haven't touched on here, but the considerations detailed in this article should lead you to the communications software package that best suits your particular needs. By making your choices in the order outlined here, you should find the path to the ideal product easy to follow. For a final rule of thumb, remember that you should look for the features you know you will need frequently and avoid those packages that give you more than your applications require. If you pursue your purchase in this way, your communications software will earn its keep without costing you more than you need to spend. □

COMMUNICATIONS SOFTWARE

Comparison Chart

The lowdown on 21 popular communications software packages

SPECIAL REPORT

by Joseph J. Elia Jr.

THINKING OF getting started in the exciting world of telecommunications but leery of the befuddling array of technical details? Don't worry, this comparison chart has been prepared with you in mind. We're not out to inform the business person who needs sophisticated terminal emulation, password security, and other far-reaching capabilities—rather, we're hoping to help the home computer user who has a basic system and a yen to get in touch with information services, bulletin boards, and other owners of microcomputers.

Indeed , when I began to work on this survey a couple of months ago, I was exactly the sort of person we're addressing here. I have a microcomputer at home and one where I work (an Apple IIe and an IBM PC), and perhaps my happiest discovery was the ability to transfer text files between those allegedly incompatible machines. I've also spent much of my time rummaging around in the information utilities and checking out various bulletin boards, all the while becoming more acquainted with the programs included in this report.

In the course of preparing the chart, which focuses specifically on those features most important to the new user, I tried each of the programs listed. While every available program is not included, you should come away with a useful overview that will help you recognize what to focus on when shopping for communications software.

You'll find a complete rundown of what you should be concerned with in selecting a communications program in "Buyer's Guide to Communications Software" on page 121, but let's take a moment here to define the less obvious features covered in the chart:

File-transfer Protocols—If two computers are going to talk sense to each other, they must use the same message system, or "protocol."

Baud Rates—The only baud rates (roughly equivalent to bits per second) that you need to worry about are 300 and 1200, which are the standard rates in general

Joseph J. Elia Jr. is the manager of editorial operations at *The New England Journal of Medicine.*

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use for microcomputers. The common wisdom that any transfer of data at rates faster than 300 baud is risky and likely to be full of errors simply no longer applies; apparently both phone lines and modems have improved greatly. The higher rates (above 1200) come into play when two computers are directly wired to each other—a condition not many home users are likely to experiment with.

File Types—All the programs we look at in the chart can send text files, in which characters are transmitted as ASCII values. Those programs that can also send binary files allow you to transmit program listings as well as text.

Capture Method—It seems silly not to save all the information flowing across your screen during the typical transmission. You can save data either in a buffer or directly on disk. The buffer method allows longer intervals to lapse before one computer has to ask the other to stop so it can write a thousand characters or so on the disk. The advantage of saving directly on disk, however, is that you can save as much information as your disk can hold—most buffers can accept only 10 to 30 thousand characters before they fill up.

File Editing—Programs offering this capability let you prepare or modify text files without having to leave the communications program and use a word processor. The editing facilities available in most of these programs aren't fancy, but they're adequate for writing simple messages.

Macros—A macro is simply a convenient preprogrammed sequence of commands that will allow you to accomplish with a few keystrokes a series of commands that might otherwise take several dozen keystrokes to execute.

Tutorial—Unlike word-processing, accounting, or spreadsheet software, communications programs handle functions that have no paper-and-pencil analogue. Because this means that they can be more difficult to learn, a tutorial designed to walk you through the program's operation can be a big help.

Unattended Operation—Many programs that offer macro capabilities will also access and retrieve information from a remote computer without your direct supervision, a convenient feature when the best time for you to access the remote computer or service is not the best time for you to be at your computer.

Document Rating—Ranging from 1 for clearest to 5 for murkiest, these subjective but comparative ratings will let you know what to expect, or in some cases what not to expect, from the printed documentation accompanying the program.

Prices—Where two prices are given in the last category on the chart, they correspond to versions for different operating systems. □

A TUTORIAL

designed to walk you through the program's operation can be a big help.

CONTINUED ON PAGE 162

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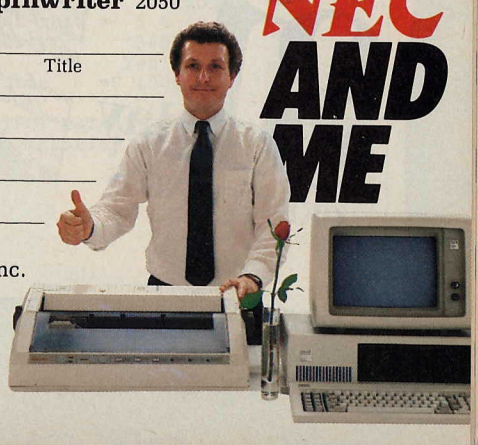


MAKING THE MOST OF

Your Money

by Kimball J. Beasley

This BASIC program helps you choose the right low-risk investment

FILL IN YOUR OWN WORKSHEET PAGE 133

Photograph by Victor Schrager

MOST OF US, says Andrew Tobias, author of several best-selling financial guides, are chicken-hearted investors. And wisely so. We know that the greater the risk we take in investing, the greater the potential reward and the greater the potential loss. Prudently bypassing riskier investments like stocks and commodities, most of us flock to low-risk, government-insured investments such as savings bonds, money market accounts, and certificates of deposit, all of which offer a good return.

But these days, with all sorts of financial institutions competing for our dollars, the investment choices are becoming overwhelming. When you start comparing alternatives, the picture is muddied by factors like early-withdrawal penalties, the number of times the interest is compounded, and many other variables. Trying to decide between short- or long-term, taxable or tax-free, and fixed- or variable-rate investments can make you settle for the simple yet much less lucrative 5-percent passbook savings account or get you so bogged down you can't make a decision at all.

To further complicate matters, constantly shifting market conditions sometimes make it profitable to move your money from one type of fund to another. Figuring out if such a switch is worthwhile can be difficult.

What's needed to make a sound decision is a way to reduce all the complicated economic factors to a single number that can serve as a basis for comparing alternate investments. The program presented in this article does exactly that. It uses established economic-analysis techniques to compute the earning potential for each type of investment you're considering. Using this figure you can shop around and compare low-risk savings plans.

Corporate investors involved with far more complicated finances than individual savers commonly avoid guesswork when assessing investment plans by using a method called net annual return on investment (ROI). This method converts numerous cash outlays and receipts over the life of an investment into a single value that represents the overall actual cash return on the investment. The higher the ROI, of course, the more profitable the investment.

Assessing Earning Potential

To see how the method works, let's look at a simple example. Suppose you put $1000 into a 5-percent savings account on January 1, expecting to find $1050 one year later ($1000 plus $50 interest). On December 31, you're happy to find a total of $1051.27, realizing you forgot to account for daily interest compounding. On April 15, however, you learn that you owe $15.38 income tax on the account's interest earnings, which leaves you with $1035.89. So the $1000 investment actually earned $35.89, an annual return on investment of about 3.6 percent, quite different from the 5-percent interest rate that you expected to earn.

In this situation, the ROI might be easy to compute using just pencil and paper or a pocket calculator. But let's suppose you bought a four-year, 10-percent $5000 savings certificate from a bank last year and you now have an opportunity to invest in a tax-exempt, two-year, 9-percent money market account. You also learn that interest paid on the certificate for the period held will drop to 5 percent if it's cashed before maturity. You have two alter-

ANALYZING A SINGLE INVESTMENT

INVESTMENT DATA DESCRIPTION	PROPOSED NEW INVESTMENT	CURRENTLY HELD INVESTMENT
Initial Investment Cost ($)	1000	
Investment Life (MONTHS)	12	
Stated Interest Rate (%)	5	
Int. Compound Periods/Year	365	
Interest Taxed (YES=1, NO=0)	1	
Face Value of Investment ($)	1000	
SWITCH OPTION DATA CURRENTLY HELD INVESTMENT		
Default Interest Rate (%)		
Early Withdrawal Penalty ($)		
Age at Switch (MONTHS)		
USER'S INCOME TAX BRACKET (%)	30	

Here's how to compute the actual net return on a 1-year $1000 savings account with 5-percent interest compounded daily. The interest is taxable, and the investor's income tax bracket is 30 percent, as shown in the worksheet at left. Once you enter the information into the computer, the program calculates the return on investment (ROI), then displays the terms of the investment along with the ROI, in this case, 3.6 percent.

```
User's marginal tax bracket  =  30 %

New investment cost          =$ 1000
New investment life          =  12  mos
New investment interest rate =  5 %
New investment cmpd per yr:     365
New investment taxed:          Yes
New investment face value    =$ 1000

++++++++++++++++++OUTPUT DATA++++++++++++++++++
New investment held to maturity net ROI =  3.6 %
```

COMPARING TWO INVESTMENTS

INVESTMENT DATA DESCRIPTION	PROPOSED NEW INVESTMENT	CURRENTLY HELD INVESTMENT
Initial Investment Cost ($)	5000	5000
Investment Life (MONTHS)	24	48
Stated Interest Rate (%)	9	10
Int. Compound Periods/Year	12	2
Interest Taxed (YES=1, NO=0)	0	1
Face Value of Investment ($)	5000	5000
SWITCH OPTION DATA CURRENTLY HELD INVESTMENT		
Default Interest Rate (%)		5
Early Withdrawal Penalty ($)		0
Age at Switch (MONTHS)		12
USER'S INCOME TAX BRACKET (%)		25

Should you switch from your 10-percent savings certificate to a 9-percent nontaxable money market account? The program calculates the return on each option and tells you which is better.

```
User's marginal tax bracket  =  25 %

New investment cost          =$ 5000
New investment life          =  24  mos
New investment interest rate =  9 %
New investment cmpd per yr:     12
New investment taxed:           No
New investment face value    =$ 5000

Cur investment cost          =$ 5000
Cur investment life          =  48  mos
Cur investment interest rate =  10 %
Cur investment cmpd per yr:     2
Cur investment taxed:           Yes
Cur investment face value    =$ 5000

Cur invt. default intr rate =  5 %
Cur invt. early wdl penalty =$ 0
Cur invt. age at switch     =  12  mos

++++++++++++++++++OUTPUT DATA++++++++++++++++++++++
Current invt. held to maturity -- net ROI =  7.8 %
                                  (best option)
Switch from cur to new invt.  --  net ROI =  7.4 %
```

natives: to keep the $5000 in the current account or accept the 5-percent default interest rate and put the money in the new account. To decide which is more profitable, you must calculate an ROI value for both.

In this instance, computing the ROI is cumbersome and complicated. And this is where the program presented here comes in. It quickly calculates the ROI value you need to tell which option is best. The only thing you have to do is enter reasonably accurate data.

Using the Program

This program is written in Microsoft BASIC and will run on most personal computers with little or no modification. The program is designed to analyze low-risk savings investments such as certificates of deposit and other time-deposit accounts that follow this basic cash flow pattern: initial cash outlay (purchase price); periodic receipts that increase slightly with each receipt and accumulate in the account (compounding interest payments); annual cash outlays that are a fixed percentage of the periodic receipts (income tax payments on earned interest); and a final cash receipt at the end of the investment's life (purchase price returned and accumulated interest earnings paid). While many variations of this cash-flow pattern exist, most low-risk savings investments take this general form.

You can use the program to analyze single savings investments as well as plans that involve switching funds from one investment to another. For each investment, the program prompts you to input information about the terms of your potential investment. Most of the data you'll need to enter is available from the savings institution from which you buy the bond or certificate. For some data, you'll have to make a reasonable estimate.

Before you sit down at the keyboard to start entering data, fill out a worksheet like the one shown on the opposite page to organize all the information and avoid inaccurate data entry. The worksheet includes the following information about each investment:

Initial investment cost: the purchase price of the bond or certificate.

Investment life: the number of months between purchase and maturity. Some investment plans have no stated life. In this case, you should estimate how long you'll probably keep your funds in that particular investment.

Stated interest rate: the amount of interest paid, based on an annual percentage of the initial investment amount. With some investments, the stated interest rate varies with prevailing market conditions. No one can predict future interest rates, so in such cases you must estimate the average interest rate expected over the life of the investment.

Interest compounding periods per year: the number of periodic interest payments made during the year. These payments are based on the principal plus accumulated interest already paid. The more frequent the periodic interest payment, the more the interest accumulates. Compounding periods are usually daily, monthly, quarterly, semiannually, or annually.

Interest taxed: with some investments, interest earned is subject to annual income tax. Other investment plans are free from federal, state, or local income tax,

Kimball J. Beasley, an engineering consultant, lives in Staten Island, New York.

FILL IN YOUR OWN WORKSHEET

Use a worksheet like this to organize information the program needs for analyzing an investment.

INVESTMENT DATA DESCRIPTION	PROPOSED NEW INVESTMENT	CURRENTLY HELD INVESTMENT
Initial Investment Cost ($)		
Investment Life (MONTHS)		
Stated Interest Rate (%)		
Int. Compound Periods/Year		
Interest Taxed (YES=1, NO=0)		
Face Value of Investment ($)		
SWITCH OPTION DATA CURRENTLY HELD INVESTMENT		
Default Interest Rate (%)		
Early Withdrawal Penalty ($)		
Age at Switch (MONTHS)		
USER'S INCOME TAX BRACKET (%)		

which significantly influences the actual net return on investment.

Face value of investment: for most investments, the amount equal to the initial purchase price. Some investments, such as zero-coupon savings bonds, are purchased at a discount for less than face value and redeemed for the amount of face value at maturity. This program assumes that interest earning is included in the face value.

Current investment default interest rate: the interest rate incurred in the event of early withdrawal. When a bond or certificate is cashed before maturity, the stated interest rate often drops to a lower value as a form of early-withdrawal penalty. For instance, the interest rate on a certificate of deposit cashed early usually drops to passbook interest rates for the period held. Also, U.S. savings bonds pay lower interest rates in the beginning of the bond life and higher interest rates at the end. In this case, the default interest rate is the average interest rate for the time that the current bond is held.

Penalty at redemption of current investment: the amount deducted at the time of early redemption. Often early-withdrawal penalties take the form of relinquished interest earnings for part of the investment life. For example, the penalty on a 10-percent $1000 certificate of deposit withdrawn 3 months early would equal 3 months of 10 percent interest, or $25 ($1000 \times .10 \times 3/12$). Depending on the investment, this penalty could be in place of or in addition to the default interest rate.

Age of current investment at proposed switch: the number of months the current investment will have been held at the time you cash it in for a new investment.

User's income tax bracket: an estimate of the average percent on income that you will pay in income taxes. For instance, if 30 cents of each dollar added to your income goes to taxes, you're in the 30-percent income tax bracket.

To illustrate how the program works, let's consider again the example of the $1000 savings account men-

INVESTMENT ANALYSIS PROGRAM

This BASIC program prompts you for data on the investment you're considering and calculates the net return on investment, a single value you can use for comparing your choices.

```
10 REM  Investment analysis program
20 REM
30 DIM CI(3), CS(3), CM(3), TI(3), TX(3),
    IN(3), RO(3)
40 INPUT "User's income tax bracket (%) "; TA
50 TA = TA/100
60 PRINT "Proposed new investment"
70 PRINT "-------- --- ----------"
80 N = 2
90 GOSUB 520
100 INPUT "Analyze switch? 1=yes 0=no "; SW
110 IF SW = 0 THEN 760
120 PRINT
130 PRINT "Currently held investment"
140 PRINT "--------- ---- ----------"
150 N = 1
160 GOSUB 520
170 PRINT
180 INPUT "Default interest rate (%) "; DI
190 DI = DI/100
200 INPUT "Early withdrawal penalty "; PN
210 INPUT "Age at switch (mo) "; AG
220 AG = AG/12
230 DR = 0: PV = 0
240 CI(1) = CS(1)*(1 + DI/CM(1)) ^ (AG*CM(1))
250 TI(1) = DI*CS(1)*TX(1)
260 CI(2) = CS(2)*(1 + IN(2)/CM(2)) ^
    (TM(2)*CM(2))
270 TI(2) = IN(2)*CS(2)*TX(2)
280 DR = DR + .01
290 P = PV
300 I = ABS(DR-IN(1))/(1 + IN(1))
310 AP = (((1 + I) ^ AG-1)/(I*(1 + I) ^
    AG))*TI(1)
320 F = ABS(DR-IN(2))/(1 + IN(2))
330 PP = (((1 + F) ^ TM(2)-1)/(F*(1 + F) ^
    TM(2)))*TI(2)
340 PV = (CI(1)-PN*(1-TA)-CS(2))/(1 + DR) ^
    AG-AP
350 PV = PV + CI(2)/(1 + DR) ^ (AG +
    TM(2))-PP/(1 + DR) ^ AG-CS(1)
360 IF PV>0 THEN 280
370 RO(3) = 1000*(DR-ABS(.01*PV/(P-PV)))
380 IF RO(3)-INT(RO(3))>.5 THEN RO(3) = RO(3)
    + 1
390 RO(3) = INT(RO(3))/10
400 REM   Insert route-to-printer command
    here
410 GOSUB 830
420 PRINT
430 PRINT "++++++++++++++++ OUTPUT DATA
    ++++++++++++++++"
440 PRINT "Current invt. held to maturity --
    net ROI = "; RO(1); "%";
450 IF RO(1)>RO(3) THEN PRINT " (best
    option)";
460 PRINT
470 PRINT "Switch from cur to new invt.  --
    net ROI = "; RO(3); "%";
480 IF RO(3)>RO(1) THEN PRINT " (best
    option)";
490 PRINT
500 REM   Insert route-to-CRT command here
510 GOTO 820
520 REM   Subroutine
530 INPUT "Initial cost "; CS(N)
540 INPUT "Investment life (mo) "; TM(N)
550 TM(N) = TM(N)/12
560 INPUT "Stated interest rate (%) "; IN(N)
570 IN(N) = IN(N)/100
580 INPUT "Interest compound periods per yr
    "; CM(N)
590 INPUT "Interest taxed? 1=yes, 0=no "; T
600 TX(N) = TA*T
610 INPUT "Face value of investment "; FC(N)
620 CP = FC(N)
630 IF FC(N)>CS(N) THEN 650
640 CP = CS(N)*(1 + IN(N)/CM(N)) ^
    (TM(N)*CM(N))
650 TN = IN(N)*CS(N)*TX(N)
660 DR = 0: PV = 0
670 DR = DR + .01
680 P = PV
690 G = ABS(DR-IN(N))/(1 + IN(N))
700 PV = CP/(1 + DR) ^ TM(N)-(((1 + G) ^
    TM(N)-1)/(G*(1 + G) ^ TM(N)))*TN-CS(N)
710 IF PV>0 THEN 670
720 RO(N) = 1000*(DR-ABS(.01*PV/(P-PV)))
730 IF RO(N)-INT(RO(N))>.5 THEN RO(N) = RO(N)
    + 1
740 RO(N) = INT(RO(N))/10
750 RETURN
760 REM   Insert route-to-printer command here
770 GOSUB 830
780 PRINT "++++++++++++++++ OUTPUT DATA
    ++++++++++++++++"
790 PRINT "Proposed new investment held to
    maturity net ROI = "; RO(2); "%"
800 PRINT
810 REM   Insert route-to-CRT command here
820 END
830 REM   Subroutine
840 PRINT "User's marginal tax bracket  = ";
    TA*100; "%"
850 PRINT
860 PRINT "New investment cost          =$";
    CS(2)
870 PRINT "New investment life          = ";
    TM(2)*12; " mos"
880 PRINT "New investment interest rate = ";
    IN(2)*100; "%"
890 PRINT "New investment cmpd per yr:    ";
    CM(2)
900 PRINT "New investment taxed:          ";
910 IF TX(2)>0 THEN PRINT "Yes"
920 IF TX(2) = 0 THEN PRINT "No"
930 PRINT "New investment face value    =$";
    FC(2)
940 PRINT
950 IF SW = 0 THEN 1080
960 PRINT "Cur investment cost          =$";
    CS(1)
970 PRINT "Cur investment life          = ";
    TM(1)*12; " mos"
980 PRINT "Cur investment interest rate = ";
    IN(1)*100; "%"
990 PRINT "Cur investment cmpd per yr:    ";
    CM(1)
1000 PRINT "Cur investment taxed:         ";
1010 IF TX(1)>0 THEN PRINT "Yes"
1020 IF TX(1) = 0 THEN PRINT "No"
1030 PRINT "Cur investment face value    =$";
    FC(1)
1040 PRINT
1050 PRINT "Cur invt. default intr rate = ";
    DI*100; "%"
1060 PRINT "Cur invt. early wdl penalty =$";PN
1070 PRINT "Cur invt. age at switch     = ";
    AG*12; " mos"
1080 RETURN
```

ASSESSING DISCOUNTED INVESTMENTS

INVESTMENT DATA DESCRIPTION	PROPOSED NEW INVESTMENT	CURRENTLY HELD INVESTMENT
Initial Investment Cost ($)	515	
Investment Life (MONTHS)	72	
Stated Interest Rate (%)	10	
Int. Compound Periods/Year	2	
Interest Taxed (YES=1, NO=0)	1	
Face Value of Investment ($)	1000	
SWITCH OPTION DATA CURRENTLY HELD INVESTMENT		
Default Interest Rate (%)		
Early Withdrawal Penalty ($)		
Age at Switch (MONTHS)		
USER'S INCOME TAX BRACKET (%)	40	

Here's how to calculate the actual net return on a 6-year discounted savings bond, initially purchased for $515 and worth $1000 if held to maturity. The actual return on investment if you hold the bond to maturity is 8 percent, significantly lower than the stated 10-percent interest rate.

```
User's marginal tax bracket  =  40 %

New investment cost          =$ 515
New investment life          =  72  mos
New investment interest rate =  10 %
New investment cmpd per yr:     2
New investment taxed:          Yes
New investment face value    =$ 1000

++++++++++++++++++OUTPUT DATA++++++++++++++++++
New investment held to maturity net ROI =  8 %
```

tioned earlier. Here we need to compute only a single ROI value, rather than computing two ROI values necessary for comparing options in a plan that involves switching funds. Hence, we need not be concerned with the default interest rate, early-withdrawal penalties, or age at the time of switching, as you can see in the completed worksheet on page 131. After you enter the data from the worksheet into the computer in response to program prompts, within a few seconds the computer displays both the information you entered and the computed ROI value. In this case, you'll see that the actual return on the 5-percent account is 3.6 percent.

Now let's look at our second example in which an investor has to choose between keeping a four-year savings certificate to maturity or investing in a two-year money market account. In this example, the program needs to compute an ROI value for both the currently held investment and the proposed new investment. As you can see in the worksheet on page 132, the ROI for switching to the new account is lower than the ROI for holding the current investment to maturity. Clearly, the investor should hold onto the savings certificate and forget switching until another low-risk savings opportunity comes along.

For our final example, let's look at analyzing the true earning potential of discounted savings bonds. Compared to assessing the earning potential of certificates of deposit, for example, assessing the actual earning potential of discounted bonds is often difficult. With discounted bonds, potential investors are frequently misled by the stated interest rate. This rate is distorted over the life of the bond by several factors, such as the number of compounding periods, and does not reflect the actual yearly earnings over the time the bond is held. The worksheet and output above illustrate how easily the program analyzes this type of investment.

Limitations

With some savings plans, the program produces a slight distortion of the ROI. For example, some treasury certificates and government bonds let you pay income taxes at the end of the investment life rather than annually. Depending on the life of the investment, the computed ROI will be slightly lower than the actual ROI.

Also, some government bonds accumulate interest on a sliding scale, paying higher interest rates near the end of the investment life. With the sliding scale, an early withdrawal penalty is built into the interest payment schedule. Consequently, you must calculate the average interest rate for the time the bond is held, as I described earlier. In such cases, the computed ROI will be slightly higher than the actual ROI.

Finally, remember that the program presented here is for low-risk investing. Make sure all investments you analyze with the program have virtually no risk. Trying to compare the return on investment of an FDIC-insured account with the return on a corporate bond that could possibly default, for instance, is like comparing apples with oranges. If you're interested in high-risk investing, get yourself a good broker or bookie. □

◄**Please Note:** If your computer has commands to route output from the video monitor to the printer and vice versa, insert the appropriate commands in lines 400, 500, 760, and 810. The exponentiation operator ^ is used often in the program (look closely or you may miss it). Some versions of BASIC use a different character to represent this function. Check your BASIC reference manual if you aren't sure what character to use.

The HP Portable

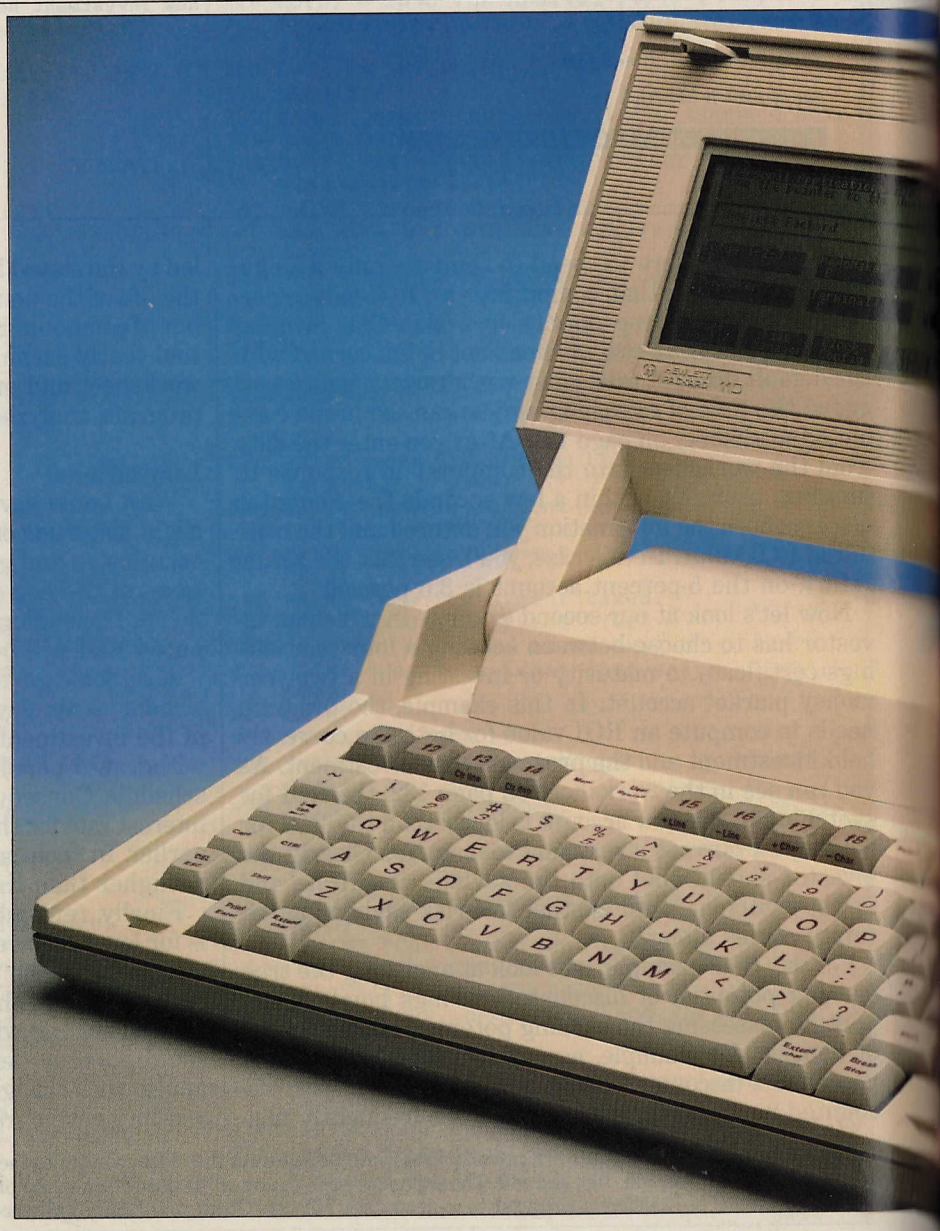
Hewlett-Packard offers desktop computer power in a portable package

by Michael J. Miller

Truly portable computers with capabilities that rival their desktop counterparts may not be new. The portables developed by Grid Systems Corporation and Gavilan Computer Corporation (for reviews, see *Popular Computing*, September 1982 and October 1983, respectively) were the first such systems that could go where no computer had gone before. Now that the marketing water has been tested, Hewlett-Packard, a relative giant among portable computer manufacturers, is ready to get its feet wet.

Hewlett-Packard in fact hopes to make a splash with its new system, modestly dubbed The Portable. The HP Portable weighs only 9 pounds, comes in a soft-sided carrying case that is smaller than most briefcases, and offers as much power as an IBM Personal Computer or an HP 150. The battery-powered machine includes an 8086 central processing unit, a 16-line by 80-character liquid crystal display (LCD), and an internal 300-baud modem. The HP Portable is bundled with Lotus Development's 1-2-3 spreadsheet program, word processing, and communications software in its read-only memory (ROM). At the time of this writing, Hewlett-Packard had priced the machine at $2995.

The HP Portable's 8086 transfers twice as much data (16 bits) at one time as the 8088 chip used in the IBM PC. And because the machine



Photographs by Paul Avis

AT A GLANCE: The HP Portable (Hewlett-Packard 110)

Manufacturer:	Hewlett-Packard Inquiries Manager, 1801 Embarcadero Rd., Palo Alto, CA 94304, (800) FOR-HPPC
Uses:	Business computing
Standard Features:	5-MHz Intel 8086 central processing unit; 384K bytes of CMOS ROM; 272K bytes of CMOS RAM divisible into electronic disk portion; 16-line by 80-column LCD with 128 by 480 dot graphics resolution; typewriter-style keyboard; rechargeable batteries; 300-baud direct-connect modem; real-time clock; 9-pin RS-232C serial port; HPIL interface; recharger; carrying case
Included Software:	MS-DOS 2.11 operating system; Personal Applications Manager; Lotus 1-2-3 spreadsheet/graphics program; Memomaker word processor; communications software
Documentation:	User's manual, quick reference guide, Lotus 1-2-3 reference guide and tutorial
Options:	Ink-jet printer ($495); disk drive ($795); HPIL interface card for HP 150 ($150 to $200) or IBM PC ($125); acoustic coupler modem; 1200-baud direct-connect modem
Base Price:	$2995 (subject to change)
Typical System Price:	HP Portable, disk drive and ink-jet printer, about $4285

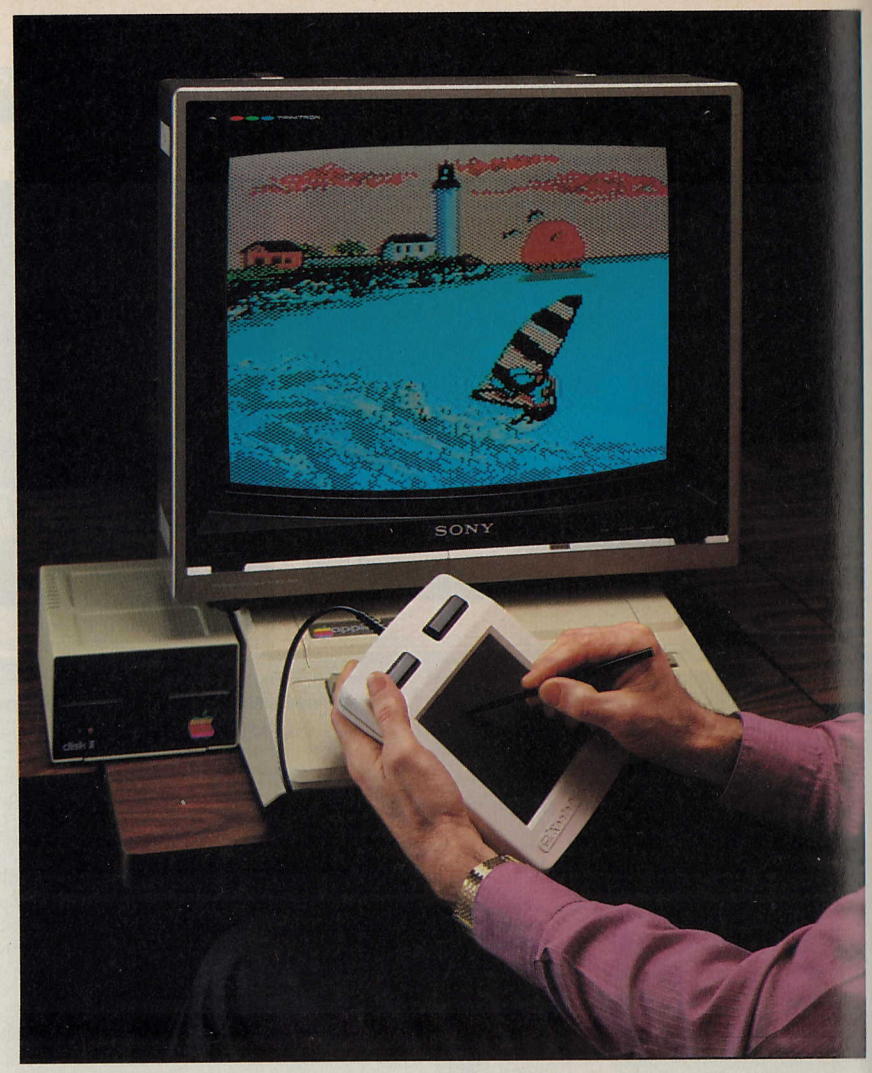
stores its programs in memory, it can access programs and files even faster. Coupling these two advantages, applications programs such as 1-2-3 run about twice as fast on the HP Portable as on the IBM PC.

Because the HP Portable was not in full production at the time of this writing, I worked with the latest prototype of the system for this review. The HP Portable is enclosed in a white plastic case. You flip open the top to expose the LCD screen and the keyboard. I found the machine's 16-line LCD display quite readable in most situations, though not as clear as a standard monochrome monitor. Although I found 16 lines adequate, you may miss the full 25 lines of text most desktop computers display.

The keyboard shows few compromises, however. Though it fits in a small case, it uses full-size keys in a standard typewriter layout. The feel compares very well with that of keyboards used on desktop machines. The keyboard includes eight function keys that correspond to instructions that appear on the bottom two lines of the screen during many applications. These act as "soft keys"

Michael J. Miller is a West Coast editor of *Popular Computing*.

Koala Conquers The Keyboard!



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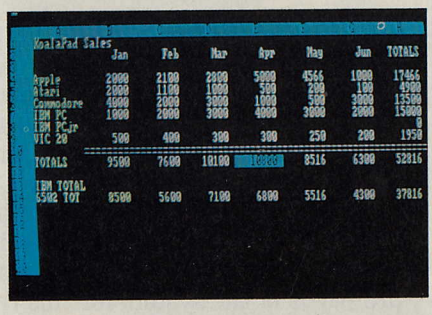

KoalaPad Sales	Jan	Feb	Mar	Apr	May	Jun	TOTALS
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Commodore	4000	2000	3000	1000	500	3000	13500
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IBM PCjr							0
VIC 20	500	400	300	300	250	200	1950
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as the functions change in different portions of the program.

On the back of the machine, you'll find a modular telephone jack that connects to the internal modem, a standard 9-pin RS-232C serial port, and a socket for a combination power adapter and battery charger. You will also find the I/O ports for the HPIL (Hewlett-Packard Interface Loop). The HPIL is a networking scheme designed specifically for battery-powered systems that lets you connect the HP Portable to as many as 31 HP peripherals, such as a digital cassette drive, a plotter, and converters that support RS-232C and HPIB (Hewlett Packard Interface Bus) interfaces.

But you won't find an on/off switch or a disk drive. In normal use, the HP Portable never shuts off; only the LCD is switched off to conserve the battery life. Pressing any key returns power to the LCD with its contents unchanged.

In lieu of a disk drive, the system's 384K bytes of ROM, which store the bundled software, function as an electronic disk designated as drive B. Other programs and user files, which can be loaded using an optional disk drive, can reside in a portion of the system's 272K bytes of random-access memory (RAM), which also functions as an electronic disk designated as drive A. With your programs and files stored in memory, you can easily take the machine anywhere.

Battery Power

The electronic disk can retain information only as long as the battery has at least some power, and according to system designer John Eaton, designers made sure that you cannot run the battery too low. When the battery charge decreases to 20 percent, the machine warns you that its power is getting low. At 5 percent, the system shuts off, but it should retain the memory for another two to three weeks.

Three size-D lead/acid rechargeable batteries power the machine. Eaton says that HP chose these batteries because they occupied space more efficiently and were more predictable in their power drain than the lighter and more conventional nickel-cadmium batteries used in most rechargeable calculators. A calculator-style recharger lets you bring the batteries to a full charge overnight, and you can use the machine while you charge it. Once charged, the batteries should provide at least 20 hours of processing, much longer than other battery-powered machines I've seen. According to the manufacturer, the permanently installed batteries have a life expectancy of five years, but must be replaced by a computer technician.

The HP Portable never shuts off; only the LCD is switched off to conserve the battery life.

Batteries also power many of the peripherals that work with the machine. An optional disk drive also uses lead/acid batteries, and an optional ink-jet printer uses nickel-cadmium batteries. You can connect either or both of these options to the machine using the HPIL.

Included Software

The HP Portable is bundled with an array of software sufficient for many business users. Lotus Development and Hewlett-Packard together customized 1-2-3 for the machine, allowing it to be stored in ROM and to display only 16 lines of charts and graphs. In addition, HP edited the program's help messages so they also fit on 16-line screens. The program cannot, of course, display color graphics on the machine's LCD.

Aside from these adaptations, 1-2-3 works just as it does on the IBM PC and other desktop computers, but it works much faster, because the program does not have to continually access a disk drive.

Three other programs are also included in the machine's ROM. The most important of these is the Personal Applications Manager (PAM), a menu-driven overlay for the operating system that provides a list of the available programs and displays the battery status. It also lets you select programs and copy, rename, and delete files using only the function and cursor keys to make selections. PAM's menu-driven system works particularly well for novice users; advanced users can bypass PAM and enter the command level of MS-DOS 2.11, a version of the same operating system used by the IBM PC and HP 150.

Also included is Memomaker, a simple word-processing program. It takes advantage of the system's function keys to change printing formats, save and load text files, and mark, copy, and delete blocks. Its limited capabilities make it easy to learn. However, HP designed the program to write short memos, and it does not offer the flexibility of most stand-alone word-processing packages. Unlike the version of Memomaker for the HP 150, this one does not create text files that are directly compatible with Wordstar.

Finally, the machine includes a terminal program that works well with the built-in 300-baud modem. You can upload and download files from another computer, a process I tried successfully using The Source, a popular on-line database.

Third-Party Software

Third-party software developers should be able to convert existing programs to the HP Portable fairly easily, because it uses the popular MS-DOS operating system and does not use fancy color graphics or a mouse. For example, Micropro ported a version of Wordstar to the machine in less than a day's time.

Other programs that should be available for the HP Portable by July of this year include Microsoft's Multiplan, Word, Chart, BASIC, Compiled BASIC, Pascal, and Fortran; Micropro International's Word-

star, Mailmerge, and Spellstar; Ashton-Tate's Friday and dBASE II; Link Systems' Datafax and Data-Link PC; Chang Lab's Microplan; Dow Jones's Market Analyzer and spreadsheet link; Microrim's R:base Series 4000; and Human Edge's The Sales Edge.

Making It Work

Machines like the HP Portable grow out of advances in CMOS (complementary metal-oxide semiconductor) integrated circuit technology. CMOS technology provides RAM, ROM, modem, and processor chips that require very little power. But while they extend battery life, they also cost four to eight times more than the integrated circuits used in most desktop computers.

Four of the CMOS integrated circuits used in the HP Portable—RAM, ROM, an LCD controller, and a chip that acts as a keyboard scanner and interval timer—are custom designed. HP manufactures all four of these integrated circuits, though it will also use outside suppliers for the RAM chip.

Trade-offs

As with any machine, designers made several trade-offs in creating the HP Portable. HP could not get CMOS versions of a 1200-baud internal modem, so instead used its CMOS 300-baud modem. It went with a 16-line display because larger, 25-line LCDs will not be available until this fall. And the machine does not have expansion sockets for plug-in boards. The reasons that HP cites for not including plug-in expandability are the expense, questions of reliability when used with CMOS circuitry, and space and weight requirements.

Designers chose not to include a disk drive for several reasons, according to Clement Lo, section manager for the project: disk drives add weight; they require a lot of power and would shorten the battery life, and disk drives in portable machines tend not to be completely reliable because such machines get knocked around. Steve Sakoman, project manager for the design, adds that applications run much faster from an electronic disk than from a physical disk drive because you don't have to wait for the drive to spin to the correct location.

Yet you need a disk drive to load programs into the electronic disk and to make copies of your files. Moreover, the machine's ROM does not contain the graph-printing routine and other utilities normally supplied with 1-2-3. Rather, the system comes with those utilities on a microfloppy disk. You could probably have your dealer load programs into the electronic disk, or back up your files on another computer via the modem or RS-232 connection, but either method seems impractical.

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Instead, HP offers two solutions in the form of optional equipment—a stand-alone disk drive and a device that lets the HP Portable access the disk drives on an IBM or HP desktop personal computer. The separate disk drive was not available for review. According to the manufacturer, it connects to the HP Portable via the HPIL connection and accepts a single double-sided 3½-inch microfloppy disk that holds 710K bytes of information. HP also says that the battery-powered drive weighs 5½ pounds and will sell for $795.

The second option, called the Portable Desktop Link, is a plug-in card for either the HP 150 or IBM PC that lets the HP Portable use the desktop computer's disk drives and other peripherals. I tested the IBM version ($125), which fits inside the IBM PC and connects to the HP Portable via the HPIL. The software included works with PC-DOS 2.0 to let the HP Portable read and write IBM-formatted disks. You only have to type "HPLINK" on the IBM PC, connect the cables, and configure the HP Portable for the number of external disk drives. The plug-in board also allows the HP Portable to use the desktop computer's printer. It worked without a hitch. The HP 150 version of the plug-in card ($150 to $200) also contains a Centronics-compatible parallel port in addition to the HPIL connectors.

HP will offer its software for the HP Portable on 3½-inch microfloppy disks, so you can read it into the HP Portable from either its separate disk drive unit or from the disk drives of an HP 150. HP does not plan to make the software available on 5¼-inch disks, so IBM PC users with the plug-in card would still need HP's disk drive unit to load HP programs.

Of course, HP designers are already working on machines to follow the HP Portable. These may address some of the present machine's limitations by perhaps using larger LCDs, more memory, and different programs in ROM. For instance, HP plans to offer a version of the machine in which 1-2-3 and Memomaker are replaced with Lotus Development's soon-to-be-released Symphony integrated software.

Final Impressions

Overall, the HP Portable is an impressive product. With its large RAM, programs in ROM, and ability to run MS-DOS programs, it has more computing power than any other battery-powered computer I've seen.

But some people will need the extra features that only a desktop computer offers—mass storage and better displays with color graphics. And when you aren't using the optional disk drive, the HP Portable is less flexible than a desktop system. For instance, if you put dBASE II in the electronic disk, you'd have little room left over for files. (Offering such programs in ROM would avoid this problem.) But these limitations may seem a worthwhile trade for true portability.

Though I was initially skeptical about the lack of a disk drive, I began to appreciate the speed of having the programs and files in memory instead. You will certainly need to buy either the optional disk drive unit or the plug-in board for your IBM PC or HP 150 to load programs and save files. HP plans to offer a larger carrying case that will hold the HP Portable, a printer, and a disk drive, but you'll probably want to leave the peripherals on your desk and take the HP Portable with you.

The HP Portable has computing power equal to that of a desktop computer; it also has an equivalent price. While HP could have designed a lower-priced system, it would have been less functional.

The HP Portable will certainly face a lot of competition from other battery-powered computers with LCDs, and future products will play a large role in determining its market share. HP managers say their goal is to be the leading firm in portable computers. On the basis of the tests I ran on the machine, I'd say that Hewlett-Packard has taken a good first step toward its goal. □

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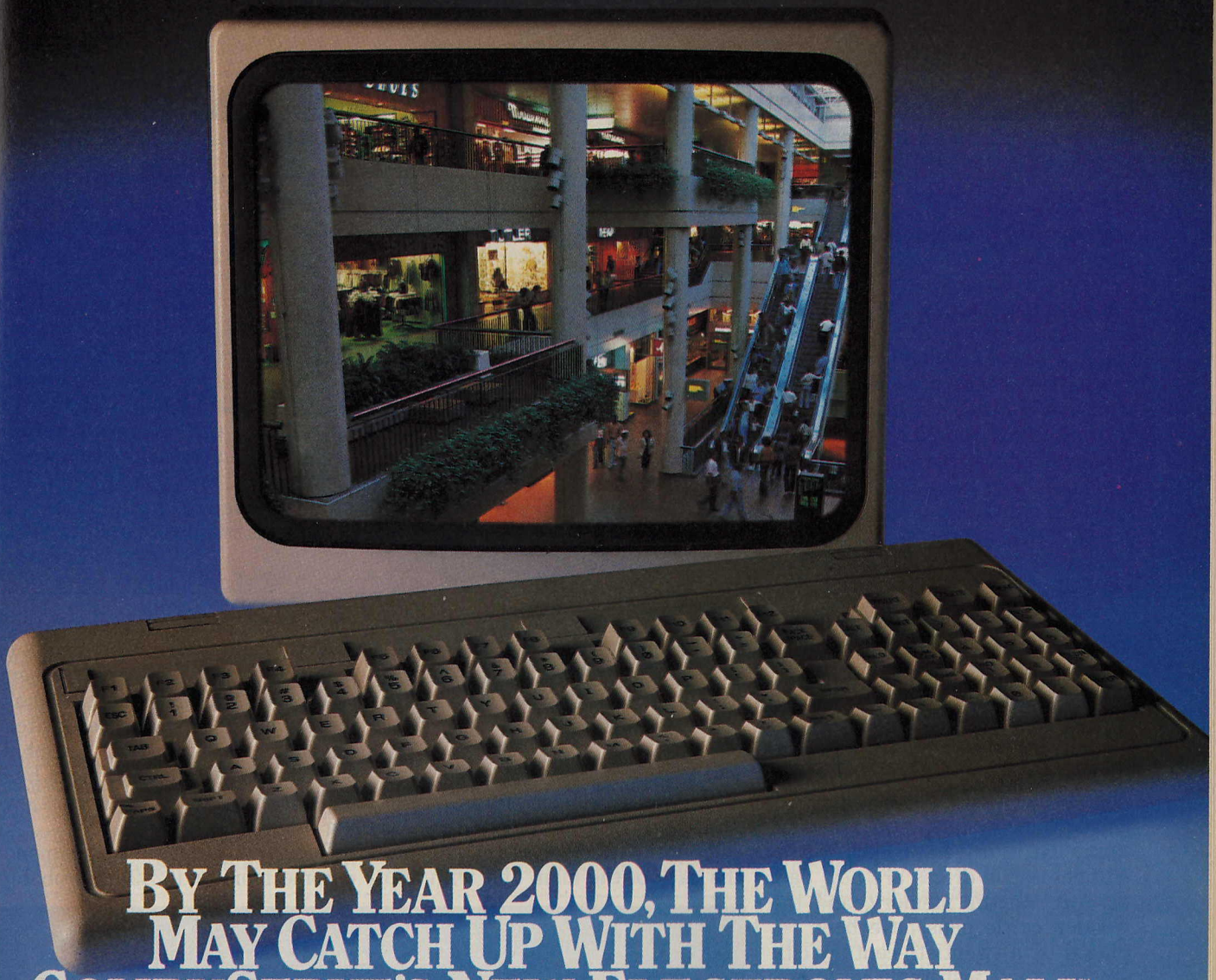

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The Tandy 2000

A system that adds innovations to MS-DOS compatibility

by Ty Halderman and
Bruce Williamson

The Lone Star State of Texas is perhaps best known for the often exaggerated independent attitudes of its people—an independence that was typified in the cowboys who signed up for long, dusty cattle drives to Fort Worth. But the cattle drives are now part of Fort Worth's memory, and the wooden cattle pens have been replaced by a twentieth-century city skyline that features the Tandy Towers—home of Tandy Corporation's new personal computer.

The Tandy TRS-80 Model 2000 Personal Computer is an MS-DOS-based system designed to compete head-to-head with IBM's Personal Computer in performance and features. Going with MS-DOS also marks a radical departure from the Lone Star arrogance that has characterized Tandy—a company that once thought it could make the rest of the microcomputer world conform to its proprietary operating system, TRSDOS (Tandy-Radio Shack Disk Operating System).

The Tandy 2000, priced at $2750, has a system unit with 128K bytes of random-access memory (RAM) and a low-profile keyboard; it requires a specially designed high-resolution monitor. The cabinets are cream white with black trim, in keeping with the new color scheme now used in all of Radio Shack's desktop computers. The power and system reset switches are safely recessed on the front panel.

Ty Halderman and Bruce Williamson are consultants who specialize in custom software for microcomputers in Houston, Texas.

Eye-Catching Display

The Tandy 2000 monitor is housed in a case matching the rest of the computer. The monitor plugs into the back of the main unit with two cables, one for the video signals and the other for power. This results in a neat and compact arrangement that allows you to control the whole system with a single power switch. A fold-down prop beneath the monitor lets you tilt the monitor up by 5 or 10 degrees to improve the viewing angle.

The VM-1 green-phosphor monochrome monitor ($249) is probably

Photograph by Mike Blake

the optimum choice for general business applications. It supports the basic system requirements, as well as high-resolution graphics. The 12-inch screen has inverse video (black letters on a green background), flashing characters, high and low intensity, and underline capability.

The CM-1 color monitor ($799) has a 14-inch screen. This monitor has the same resolution and features as the VM-1 plus color. It requires a high-resolution graphics board ($449) with color-support chips ($199) installed.

To avoid certain kinds of flicker and to obtain some special graphics features, the display is *non-interlaced.* That is, instead of every other line of the phosphor-coated screen being scanned by the electron gun as is done in most personal computer monitors, the lines are scanned in continuous succession. This arrangement eliminates what is known as *interlace flicker.*

Another feature eliminates the hassle of trying to read a long disk directory as it speeds off the screen. The Tandy 2000 provides a slower scroll mode called "smooth scroll," in which the characters move up the screen in unison, much like the credits at the end of a movie, rather than jerking up line by line. The smooth scroll display is easy to invoke using two keys and is a real pleasure when you need it. But the smooth scroll is not always appropriate—it may be too slow for some applications, and it does not operate in BASIC when using color graphics.

The high resolution of both monitors produces characters that are sharper and better formed than those on many competing machines. The difference is particularly noticeable on the high-resolution color monitor.

Keyboard Superiority

The 96-key keyboard of the Tandy 2000 offers several advantages over the keyboard on the IBM PC. The key labels are not cryptic, and the layout is kind to typists.

The space bar is the only key at the bottom of the layout, leaving ample room for resting the heels of your hands. The keys operate smoothly, so typing is virtually effortless.

The tops of the special control keys (ENTER, CTRL, TAB, and so forth) are larger than those of the PC, which means you'll make fewer mistakes by hitting the wrong key.

At the right side of the keyboard is a numeric keypad. When the Num Lock key is engaged, these keys produce characters such as the tilde (~), the backslash, and the grave accent (`). In addition, three of the keypad keys have functions (not active in some programs) for Page Up, Page Down, and END. The 5 key has a raised bar on it for touch keying, and the keypad layout is flat, rather than sculptured like the main keyboard.

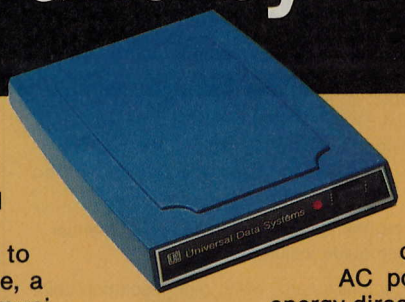
In comparison, there are serious deficiencies in the IBM PC's keyboard. The Num Lock and Caps keys do not give any indication of whether they are on or off, and the numeric keypad also contains the cursor control keys. This arrangement can lead to problems, particularly when using the cursor keys, as you are very likely to get numbers when you wanted movement, or vice versa. To further complicate the matter, the PC uses a two-key combination to pause the computer's activity, followed by another keystroke to resume. One of the keys used in this sequence is the Num Lock key. If you strike Num Lock once too often during this process, you have toggled the numeric keypad to the other state, without knowing it.

The Tandy 2000 keyboard has avoided these problems. First, the cursor keys are independent of the numeric keypad. Second, both the Num Lock and Caps keys have red light-emitting diodes (LEDs) that light up when those keys are engaged—eliminating any guesswork. However, it would be nice if Tandy had installed such lights on the HOLD and PRINT keys as well. Finally, there is a separate HOLD key which, when struck once, pauses the computer's activity; striking the

AT A GLANCE: Tandy TRS-80 Model 2000 Personal Computer

Manufacturer:	Tandy Corporation, Fort Worth, TX 76102
Uses:	Business applications, computer-aided design, personal computing, professional analysis, schools
Standard Features:	Intel 80186 microprocessor at 8 MHz clock speed; MS-DOS version 2.0 operating system with GW-BASIC; 128K bytes of RAM (expandable to 768K bytes); power-up diagnostics; sound; 90-key sculptured keyboard with numeric keypad and 12 special function keys, retractable legs, keyclick, and 6-foot coiled cable; 25-line by 80-character video output (to optional display units); dual 5¼-inch 720K-byte (each) floppy disk drives; four user-accessible plug-in card slots; Centronics-compatible parallel printer port; RS-232C serial port; monochrome monitor connection; AC outlet for monitor
Documentation:	Introduction manual, BASIC programming manual, MS-DOS manual and Model 2000 quick-reference guide included
Options:	High-resolution monochrome graphics card, $449; high-resolution color graphics chip set, $199; TV/Joystick adapter card, $249.95; Digi-Mouse/Clock controller board, $119.95 (includes Windows software); Digi-Mouse (requires board, above), $99.95; 128K-byte plug-in RAM board, $499; 128K-byte upgrade for plug-in RAM board or main circuit board, $299; internal 10-megabyte hard disk, $1699; VM-1 monochrome monitor, $249; CM-1 color monitor, $799; monitor pedestal (for VM-1 monitor), $89.95; floor stand, $145; programmer's reference manual and hardware reference manual, $19.95 each
Other Languages Available:	Pascal, BASIC compiler, FORTRAN, Assembler
Base List Price:	$2750 (without display monitor)
Typical System Price:	Base unit, additional 128K bytes of RAM (total 256K), monochrome monitor—$3298

Reach out and byte someone!



Your desk-top computer system is only a beginning — plug a low-cost UDS modem into the RS-232 port and a whole new world of communications opens up!

UDS modems add a new dimension to personal computers. For professional use, a modem permits two-way, hard-copy communication between home office and branches or among the branches themselves. Electronic mail becomes a reality. Sales, cost and inventory updates can be sent over ordinary telephone lines at economical, after-hours rates.

When you use your computer for personal applications, the modem allows you to access up-to-date market information, receive news and weather summaries, check airline schedules or even electronically scan out-of-town newspapers. Long-distance game playing and computer-age personal correspondence become instant realities.

The wide range of UDS modems includes one that fits your requirement perfectly. Top of the line is the microprocessor-based 212 A/D which communicates at 0-300 or 1200 bps, stores and automatically dials up to five 30-digit numbers and includes a complete prompting menu and full automatic test capabilities. Yet, with all these features, it costs only $645.

At the other extreme is the $145 103 LP, offering simultaneous two-way communications at 0-300 bps without an AC power cord. This unit siphons operating energy directly from the telephone line!

In between is a large variety of units — many of them in the LP no-power-supply design and all fully FCC certified for direct connection to the telephone system.

Don't be a computer hermit — treat your system to a UDS modem; then you can reach out and byte someone! For details, contact your favorite computer dealer or Universal Data Systems, 5000 Bradford Drive, Huntsville, AL 35805. Telephone 205/837-8100.

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key a second time causes the computer to resume its activity.

But the Tandy 2000 keyboard is not without fault. The PRINT key, if struck once (which is easy to do accidentally), will echo everything sent to the display to the printer. If the key is struck while holding down the Shift key, a "snapshot" of what is currently on the screen will be sent to your printer. If you do not have a printer connected, the system will freeze up for about 6 seconds while in BASIC and for nearly a minute while in the command level of MS-DOS.

The system also has 12 special function keys. (The PC has 10, which seems a bit odd since most IBM display terminals have 12.) The 12 keys on the Tandy 2000 are conveniently located across the top of the keyboard, separated into blocks of four. This makes it very easy to find the key you need quickly. In addition, directly over the keys are labels that specify the uses of individual keys.

High-Density Disk Drives

The Tandy 2000 can be equipped with two 5¼-inch floppy-disk drives or one floppy drive and a 10-megabyte hard disk. The hard disk fits inside of the main unit in the center, and the floppy drives will fit on the right side.

The low-height floppy drives require no more space than one 5¼-inch drive used in the IBM PC. Better still, each of these little guys on the Tandy 2000 holds 720,000 bytes of data—twice the capacity of a disk formatted on the IBM PC. The drives use a locking mechanism, are spring-loaded, and will eject when you open them, making disk insertion and removal very easy. There is an activity light on the front of each drive to indicate when it is in use.

Moreover, the drives allow some data compatibility with the IBM PC. That is, a disk from an IBM PC may be read, generally successfully, on the Tandy 2000. Although Tandy makes no further claims, we found that the root or primary directory of a disk may be read in either machine, no matter which machine created it. However, other data on a disk created by the Tandy 2000 cannot be read by the IBM PC. We also found that a disk formatted by the IBM PC can be written to by the Tandy 2000 and subsequently read by either machine. This ability suggests that both computers could share the data on a single disk, although we have found that the Tandy 2000's method of writing to an IBM PC-formatted disk is not reliable.

The 2000 can read IBM PC data disks, but Tandy makes no further claims about compatibility.

Internal Features

The Tandy 2000 uses as its central processor the Intel 80186 processor, an 8088-compatible that communicates twice as much data at once as the 8088. Technically, using the 80186 reduces the number of integrated circuit chips needed by 20, which also reduces production costs and thereby adds a marketing edge for Tandy. Furthermore, the 80186 can operate at a faster clock speed than the 8088 and can perform certain functions faster even at the same clock speed. What the user notices is the overall speed improvement. The combination of these features results in a machine that is two to three times faster than the IBM PC.

Other features include a tone generator that allows audio prompting and rudimentary musical capability. The printer port, standard equipment on the Tandy 2000, supports any Centronics-compatible printer. Also included is a port for an RS-232C interface.

Expansion Options

Four expansion slots are accessible from the rear panel without removing the cover. Expansion boards are user-installable. The Tandy 2000 is designed to allow user memory expansion up to 768K bytes of RAM versus the PC's 640K bytes. However, the Tandy 2000's expansion bus structure is unique; therefore it will not accept expansion cards manufactured for the PC.

In our opinion, for any serious applications, you should purchase a minimum of 256K bytes of RAM with any MS-DOS computer. To reach this level on the Tandy 2000, a 128K-byte chip set ($299) is installed on the main board. Additional memory expansion is possible through two add-on memory boards ($499) with 128K bytes of RAM each. Each board accepts a 128K-byte chip set, bringing it up to 256K bytes. The total available RAM with both add-on boards and three additional chip sets is 768K bytes. Tandy's prices for the add-on memory boards are high compared to prices for similar boards for the IBM PC.

Tandy also offers a TV/Joystick option ($249.95). Although more expensive than the monochrome monitor, it allows the use of Radio Shack Color Computer joysticks and a user-supplied TV set. This display is limited to 40 characters per line and low-resolution graphics.

One of the more exciting options is the Digi-Mouse/Clock Board ($119.95), which allows the use of the Digi-Mouse ($99.95). These two devices give the user access to the Microsoft Windows operating environment, which is included with the board.

Other optional equipment includes mounting hardware. For the user who wants an uncluttered desk, there is a floor stand for the system unit ($145) and a pedestal for the VM-1 monitor ($89.95). The floor mount is designed to hold the main unit on end (vertical position) with the disk drives at the top. Floor mounts such as this have become popular with many well-known manufacturers, including Hewlett-Packard, NCR, and Digital Equipment Corporation.

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Software

The Tandy 2000 is not an IBM clone, although it is an MS-DOS-based computer. The distinction may be a bit muddy to some, but there is still a distinction. Although the Tandy 2000's implementation of MS-DOS includes system calls and BIOS entry points that are compatible with the IBM PC, many programs written for the IBM PC will not run as is on the Tandy 2000. In most cases this is because the software uses memory addresses and other machine-specific methods to operate presumably faster or better.

In addition to MS-DOS, the Tandy 2000 includes GW-BASIC, assembly language tools, a line editor, and a host of miscellaneous utility commands. The BASIC language that comes with the Tandy 2000 is virtually identical to that of the IBM PC, although a few of the undocumented commands on the IBM PC version are missing from the version for the Tandy 2000.

Supporting the 2000

Tandy has specifically chosen MS-DOS to enable third-party software developers to support its new machine. Tandy is also very open about giving both software and hardware developers enough information to write programs and build add-on boards. Technical manuals are available for both the hardware and MS-DOS directly from Tandy.

This is a welcome attitude so far as third-party developers are concerned. In the earlier days of the TRS-80 line, no information was available. Gradually (and somewhat grudgingly at first) technical information was distributed. Tandy seems to have finally abandoned the "invented here" requirement.

The Tandy 2000 Personal Computer is a pleasure to use. Instead of being a ho-hum addition to an overcrowded marketplace, it provides several significant improvements over its competitors. Although the Tandy 2000 won't rustle all the single users in the market from IBM, it should at least round up the mavericks. □

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puter's active, internal memory as needed.

While allowing for extremely long documents, the paging of virtual memory also helps Ovation quickly handle data linking and recalculations. When you alter data that is linked to other contexts, changes and recalculations are made to other parts of the file only as necessary in order to save time. You are not discouraged from playing around with figures just because the system makes you twiddle your thumbs while it updates a change that you might decide to undo in the next second.

Command tracking and automatic linking go on unobtrusively whenever you're working with Ovation, and the Undo and Calculate commands best reveal the advantages of this approach to integration. The Undo feature specifically stores your last message to the system and lets you recall or cancel it if you should change your mind. Moreover, if your last command was a potentially destructive one such as Erase, Ovation will ask you to confirm that you really do want to get rid of that chart, sentence, or block of spreadsheet cells. The system's command tracking enables it to recognize what you're erasing and ask you about it specifically rather than giving you a generic "Are you sure?"

Calculate is a powerful command that lets you embed a formula anywhere in an Ovation file in such a way that only the result of the calculation is visible. For example, a personal report could present figures for payroll deductions based on complex calculations involving salary records stored in your database. Because the system remembers the entire formula for the calculation (not just the result), and because the calculations embedded in the report are linked to the records in the database, the final report will reflect any last-minute changes to the pertinent database records. The formulas underlying those figures will have been automatically recalculated when you updated the database.

Software Specifics and Hardware Requirements

The bulk of the Ovation system is written in C, a programming language that enhances the portability of the system among various microprocessors. (Although currently available only for the IBM PC and the Tandy Model 2000, Ovation should be relatively easy to adapt to other 16-bit microcomputers.) At points where maximum speed is essential, though, the software has been coded in the assembly language specific to a particular processor. These assembly-language routines include many of the system's input/output operations, especially those that handle the display of graphics.

These graphics I/O routines were written in assembly language so that the system could offer instant graphing capabilities. Not only can you access Ovation's graphics functions without temporarily having to set aside the larger task you're working with, but graphs and charts are also created on the spot—you see the results as they are being graphed and can modify or revise them without having to wait for a printout.

But because the $795 software package allowed no trade-offs that might undermine the consistency and simplicity of its common command environment, Ovation's hardware requirements are rather formidable. You'll need an IBM PC or Tandy Model 2000 with at least 512K bytes of internal memory; a color-graphics card for the IBM or high-resolution graphics options for the Model 2000 are also required. And as indicated above, the piece of hardware that really carries the load is the required 10-megabyte hard disk.

OVATION'S *total integration means that its on-screen windows are a convenience, not a necessity*

Other Features

Ovation's common command environment and automatic data linking are the system's most prominent aspects, but other features further enhance its ease of use. For example, you can save a sequence of keystrokes for later use. Because the system routinely stores the commands you enter, all you have to do to create a reusable sequence of commands (commonly called a keystroke macro) is tell the system you want it to remember the desired sequence under a certain name.

This capability lets you create sophisticated preprogrammed operations that free you from repetitive typing. For example, using the macro feature you could "teach" Ovation to call up an on-line information service, retrieve today's stock prices, update running graphs, and even merge the data into preformatted memos addressed to names on a database record. If you have an auto-dial modem, this entire process could be accomplished with just a couple of keystrokes. Thanks to the size and speed of the hard disk, for all intents and purposes there is no limit to the length of macros Ovation can accommodate.

Ovation also gives you the option of splitting the display screen into several windows. Although integrated windowing environments use boxed-off screen areas as a means of handling a series of integrated applications (see "Windows While You Work," May 1983, page 96), Ovation's total integration makes that sort of windowing unnecessary. In Ovation, windows are a convenience, not a necessity.

For example, you might find it helpful to create a pair of windows when you want to copy something from one document to another. Calling up each document in a separate window makes it easy to see what needs to be moved—all you do is issue the Copy command, mark the section to be moved, and indicate its destination. Similarly, you might want to put the same long document in each of a pair of windows so you can scroll to widely separated points for comparison or copying.

Windows also come in handy for monitoring background tasks. Although it's not a multitasking system,

Ovation does let you run self-contained operations such as communications or printing in the background while you access the full power of the system to work on more input-oriented applications. Creating a small window to view the background operation lets you monitor its progress while still leaving you plenty of room to handle the more active task.

Also, a series of templates furnished with Ovation enhances the system's immediate productivity. The company has developed approximately a dozen standard formats for memos, business letters, spreadsheets, columnar forms, and the like. These templates let you get started without designing your own forms, but perhaps more important, they can easily be modified to suit your particular needs.

TO AN unprecedented degree, Ovation delivers the ease of use promised by integrated software

Another feature that deserves attention is Ovation's Zoom command. You can use this command to get a preview of charts or graphs in high resolution and true color so that you'll have an idea of what the graphic image will look like when printed. As with all Ovation commands, Zoom is simple to use. You indicate with the cursor the graph or chart that you want to preview, and within a second or two the screen clears and the image appears at maximum size with all colors filled in. When you've seen enough, you're returned to the point where you had been when you called Zoom. This command also enables you to create a sequence of high-resolution graphics displays for business presentations—a show that's just as impressive as the traditional slides but far less expensive.

Room for Growth

The foregoing emphasis on the ease with which a newcomer to Ovation can begin to do productive work may lead you to wonder what provisions have been made to accommodate the more advanced user or the growing sophistication of one who starts out as a novice. Let's look at several features that let you customize the system's operation to suit your particular needs and your level of experience.

Ovation's adaptability begins in its documentation, which is structured to reinforce a user's growing experience and facility with the system. The first goal is to get the beginner up and running, and a disk-based tutorial works together with the common command environment and flexible templates to achieve this. Details of the more complex customization that the system allows are saved for later in the documentation.

After you're comfortable with Ovation's basic operation, the documentation lets you in on several advanced adaptations that can make Ovation not only more suited to specific needs but also faster to use. For instance, you'll learn that you can customize certain application-specific parameters such as page format, communications settings, and other default values by accessing "control panels." While beginners won't even know of the existence of these control panels, more experienced users will appreciate the flexibility they offer.

Furthermore, many advanced users know that those features designed to make a system easy to learn often begin to get in the way once you're familiar with basic operations. Ovation has recognized that this could be a criticism of its common command environment, especially with its command prompts that virtually lead you by the hand. So the company has included methods of bypassing the command menus and prompts—when you become familiar with the commands available and what you must do to execute them, you can leap over the menus and prompts and access the powers of the system more directly. In these ways Ovation offers the beginner an unintimidating yet powerful system while still appealing to the old pro.

OVATION'S COMMANDS

The following list includes the 26 commands in Ovation's common command environment and brief descriptions of their functions. This list represents the latest preproduction version at the time of this writing—actual command names may change slightly before final product release.

CALCULATE	Embeds a formula such that only its result is seen
CENTER	Centers text
COMMUNICATE	Accesses communications functions
COPY	Copies specified text, graphics, spreadsheet cells, or database records to indicated location
ENHANCE TEXT	Allows for designation of italics, boldface, underlining, superscripts, and subscripts
ERASE	Deletes specified material
FILE	Stores newly created or modified document
FIND	Locates designated string or named point
FORMAT CELL	Specifies individual format for a given spreadsheet cell; overrides global format
GET	Retrieves document from disk file
GRAPH	Accesses all graphics functions
INFORMATION FILE	Allows design of and access to information-management files

A Revolution in Integration?

Thanks largely to its innovative common command environment, Ovation has already received a great deal of attention throughout the computer industry. Many have praised the system as being head and shoulders above other attempts at integrating common business applications. But is it really that revolutionary?

The answer is yes and no. The development of integrated software was not pioneered by Ovation, and thus the product owes much to those systems that have preceded it to the market. But the developers of Ovation have to an unprecedented degree given us the ease of use that the concept of integrated software always promised. Ovation president Thomas J. Gregory suggests that his group was able to accomplish this because it "brought no baggage into the project," that is, the company had no previous products to worry about supporting or being compatible with. Facing a clean slate, Ovation Technologies was able to define exactly what it wanted its system to be and then create it from the ground up.

This is not to say that Ovation is the end all and be all. Users whose work tends to be concentrated in one application might find an integrated system centered around that particular function more suited to their needs. If you find yourself working with spreadsheets 80 percent of the time, maybe Lotus's 1-2-3 would be more to your liking, or if database management is your primary application, Context MBA could be your best bet. But if your work involves a fairly balanced need for various applications, Ovation integrates them in a way that is easier to use and potentially more productive. Indeed, company officials would not single out any Ovation application as being the strongest or most powerful.

Each new integrated software product to hit the market in some ways redefines the genre, and there's some question whether a single menu of 26 commands is the most efficient way to achieve integration. Ovation is one of several companies developing new approaches to combining traditional applications in the same package, and the common command environment and its all-embracing workspace offer many advantages, especially for the beginner or part-time user. But someone who will be working with an integrated package so frequently that a little learning time will not be begrudged may eventually miss the structure, adaptability, and specific powers offered by a well-designed series of nested menus.

Certainly Ovation will be forced to compete with new products aimed at the same or similar markets—most notable among these are the recently announced integrated packages from Lotus and Ashton-Tate. Lotus's Symphony, an outgrowth of 1-2-3 that adds word-processing and communications functions, could well be more adaptable than Ovation in the hands of an experienced user, but it is unlikely to be as accessible to the uninitiated. Ashton-Tate's new entry, called Framework, strives for ease of use with an innovative outlining feature designed to help users organize and keep track of their work—a convenience that neither Ovation nor Symphony offers. One thing at least is certain: those in the business-computing community can no longer complain of the lack of powerful integrated software. (Look for complete reports on Symphony and Framework in an upcoming issue.)

On yet another front, Ovation could suffer somewhat from its extensive (and expensive) hardware requirements. Potential users may be discouraged by the need for a hard disk, for example. But when we consider that recent studies reveal a large number of expensive microcomputers standing idle because of the lack of friendly software, it seems probable that the business-computing community will be willing to make the investment in hardware that should actually earn its keep.

Despite the intense competition, Ovation Technologies is likely to find a place among the now famous success stories in the software industry. The company garnered over $6 million in venture capital before its product hit the market—quite an endorsement in itself. I predict that it won't be long before Ovation is in the thick of big-league competition with Visicorp, Lotus, Context, Ashton-Tate, and other heavy hitters. □

INSERT	Inserts specified text, numbers, graphics, etc.
MACRO	Creates reusable keystroke sequence
MAKE RULER LINE	Inserts ruler line at any point for altering formatting parameters
MOVE	Moves specified text, graphics, spreadsheet cells, or information-management records to new location; deletes from previous location
NAME	Links specified name to any point or block for easier reference and manipulation
PAGE	Overrides default page settings
PRINT	Submits a document or specified section to print spooler
QUIT	Closes down system
REPLACE	Works together with Find for global search and replace
SORT	Sorts information-management records or spreadsheet entries by specified criterion
SPREADSHEET	Creates a spreadsheet at any specified location in document
UNDO	Cancels preceding command
WINDOW	Opens on-screen window at specified point
ZOOM	Enlarges and displays graphs or charts in color; also used for sequenced presentation of high-resolution graphics

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science fiction, UFOs, and arms control.

In addition, Compuserve's Special Interest Groups or SIGs provide a place where people with a common interest can post messages and share information. The SIGs have titles like Family Matters, Computer Art, Religion, Cooks' Underground, CP/M SIG, and a host of other specialized SIGs for personal computer owners.

Exchanging Software

Hunting for free software on BBSs and national information services can be like panning for gold. You can spend a lot of time sifting through gravel, but from time to time you'll find some valuable nuggets. The software might not be really "free" when you take into account your phone bill or the network connect charge, but the lure is almost irresistible.

The free programs are usually the efforts of hobbyists who've created something fun or useful and want to share their work with others. The programs won't have the polish or customer support of commercial software. Still, the price is right, and you can find some challenging games and useful utilities. You can often find free software on bulletin boards devoted to your particular computer. Other places to look are Compuserve's computer SIGs and the user-publishing area of The Source.

If you plan to receive or "download" a lot of programs over the phone lines, you'll probably want to get communications software that supports a file-transfer protocol that checks for errors. Such a protocol makes sure that noise on the phone line hasn't corrupted the information being transferred. All it takes is one misplaced character to keep your new program from running. And unless you use specially conditioned and more expensive phone lines, errors are very likely to creep in.

For a file-transfer protocol to work, the computers on both ends of the line must have software that recognizes the same protocol. Many CP/M and IBM PC bulletin board systems use a public-domain protocol called XMODEM, originally developed by Ward Christensen, a pioneer of the BBS movement. His CP/M program, Modem 7, uses XMODEM, as does the popular communications package for the IBM PC, PC-Talk III (see the software review on page 174). Modem 7 is yours free for the using on many BBS systems. For a listing of other communications software that includes error-checking protocols, see "Communications Software Comparison Chart," (page 126).

If you download a lot of programs from Compuserve, you can use the protocol in Vidtex, a communications program available from Compuserve. Vidtex costs between $39 and $69.95, depending on your brand of personal computer. With it you can receive and transmit programs to Compuserve without worrying about possible errors. In addition Vidtex gives you access to Compuserve's high-resolution graphics, available for graphing financial information and for presenting weather information in graphic form.

Playing Games

Video games have come a long way since Atari first took the world by storm with Pong. But on-line computer games are still back in the dark ages. The three consumer-oriented information services, Compuserve, Delphi, and The Source, offer game libraries, but don't expect arcade-style shoot-em-ups or indeed anything with graphics. The information services haven't yet figured out how to provide the same animation for all the different computers with varying graphics capabilities.

Instead, the services provide adventure games, casino games, and war games variations, all of which rely on text alone. For instance, most offerings on The Source are tried-and-true computer classics, such as Adventure, Hangman, Lunar Lander, Wumpus, Blackjack, and Star Trek. All of these are single-player games—the contest is between you and The Source's mainframe computers.

For multiplayer games you'll have to log on to Compuserve. Here, in addition to single-player games, you can find Space War, Decwars, Megawars, Sea Wars, and Black Jack, in which you pit your skills against those of other Compuserve subscribers. Two of the most popular games are Decwars and Megawars, spin-offs from the classic single-player Star Trek. You join the Empire or the colonists and issue text commands that fire your phasers at the enemy or maneuver your ship to avoid being hit. Real people in other parts of the country pilot the other star ships, and many have racked up enough points to become "admirals" listed on the games' honor rolls. Compuserve sells instruction manuals for these games, and your ship won't survive long if you attempt to play without studying the manual carefully.

Delphi plans to offer some multiplayer games, but when this article went to press, its library contained only single-player games.

If you live within local calling distance of Evanston, Illinois, you can enjoy a multitude of on-line games at lower prices than those charged by the major information services. Evanston boasts a local area service called Gamemaster that lets you play Backgammon, Football, Nuke Strike, and many other games for only $3 per hour. If you call from out of the area, however, the long-distance charges can make time on Compuserve or The Source look cheap by comparison.

Finding Information

Universities, large corporations, and government agencies have been using computerized information services for years. But it's been only recently, with the spread of personal computers, that individuals could gain entrance to these storehouses of information.

These data banks contain dizzying amounts of information, including up-to-the-minute stock quotes, entire encyclopedias, current news and sports, movie and restaurant reviews, periodical indexes, and reference works full of specialized scientific, legal, and economic information. You can think of this world of on-line information as a well-stocked library, which charges different usage fees for different sections.

The four major national information services, Compu-

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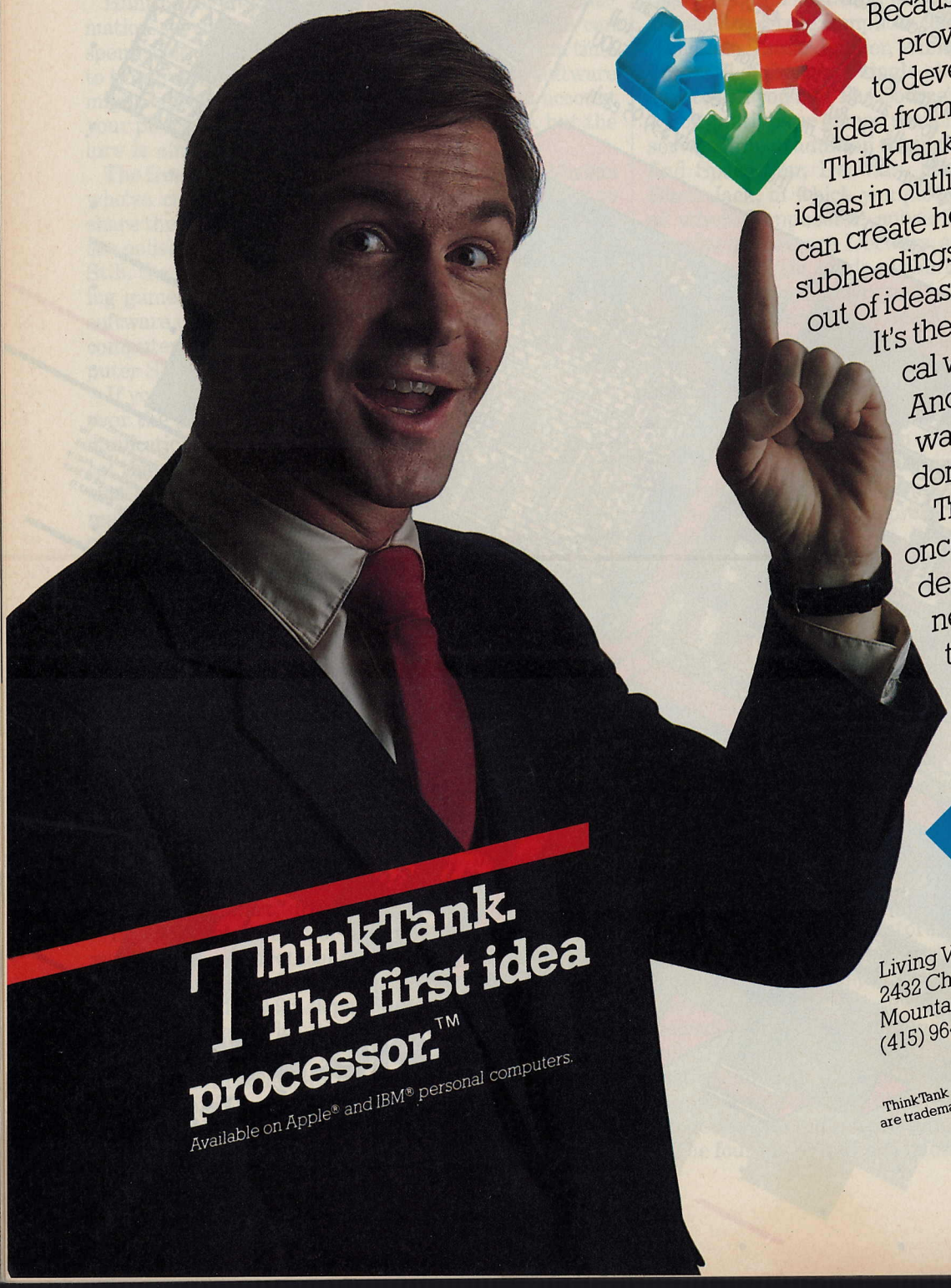

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serve, Delphi, Dow Jones News/Retrieval Service, and The Source, are the general-interest section of our library. Like the daily newspaper, they all carry late-breaking news, cover business and sports, report on the latest stock market activity, and include special-interest sections, such as book and movie reviews. In addition, Compuserve, Delphi, and Dow Jones have a general encyclopedia on-line, where you can find the names of Henry VIII's wives or the history of the transistor. You can also find on-line help-wanted ads, medical information, advice from the College Board on preparing for the Scholastic Aptitude Tests, and almost any kind of information that normally takes you hours to find in the local library.

If you're planning a trip, you'll want to tap into the airline and travel services that these information vendors supply. The Source's airline service, for example, can help you plan routes and schedules; you type in your point of departure and destination, and the computer gives you several possible flights to choose from. In addition to an on-line travel agency that specializes in discount tours and cruises, Compuserve offers the Official Airline Guide (which lists arrivals and departures for all airlines around the world); the Mobil Travel Guide to Hotels, Motels, and Inns; and a hotel reservation service.

To get detailed weather reports and forecasts around the country, you can access Compuserve's NOAA (National Oceanic and Atmospheric Administration) Weather Service. And for Tuesday's forecast in Paris, check the Dow Jones Weather Report, which covers more than 50 cities in the U.S. and abroad.

Dow Jones, as you might expect from the name, pays extra attention to financial and business news. It can give you current quotes, with a minimum delay of 15 minutes, of securities traded on the New York, American, Midwest and Pacific stock exchanges, as well as quotes from the national over-the-counter market, updated six times daily. It also lets you search for news stories of interest that have appeared in the *Wall Street Journal*, *Barron's*, and the Dow Jones News Service within the last 90 days. Other offerings include corporate-earnings information, "Wall Street Week" transcripts, and weekly economic summaries.

Compuserve's recently introduced Executive Information Service also focuses on business and finance. It offers a timely ticker-retrieval service for stock market information, a database of Standard and Poor's descriptive information on more than 3000 companies, reports on market trends, and earnings estimates from the Institutional Broker's Estimate System.

In the reference section of the library are the specialized databases, bibliographies, and reference works on hundreds of different topics. On-line databases can be computerized versions of printed reference works, such as *Books in Print*, *Index Medicus*, magazine indexes that make the *Readers' Guide* seem obsolete, or the U.S. Government Printing Office's monthly catalog. Other databases consist of collections of abstracts of journal articles, lists of chemical reactions, compilations of insurance statistics, and so on.

Two of the largest and oldest providers of such databases are Dialog in Palo Alto, California, and Bibliographic Retrieval Service (BRS) in Latham, New York. Until recently, you would have paid an average of $100 per hour to use Dialog and somewhat less for BRS. However, both services now offer economical evening rates, well within the reach of home computer users.

Dialog's evening and weekend service, called Knowledge Index, lets you use 20 of Dialog's most popular databases between 6 p.m. and 5 a.m. for only $24 per hour (including communications charges). Among the databases are career-placement registries for experienced personnel and students; magazine and newspaper indexes; a directory of public schools throughout the U.S.; a software index that lists more than 10,000 commercially available programs for personal and professional use; and directories of foundations and trade, professional, and fraternal associations.

DIALOG *and BRS, two of the largest database services, now offer special evening rates for home users*

BRS has a similar service called BRS After Dark, which operates between 6 p.m. local time to 4 a.m. Eastern Time and on weekends. It gives you access to more than 30 databases, including on-line versions of *Books in Print* and the *Harvard Business Review;* Medline; Family Resources from the National Council on Family Relations; and information from other social service, scientific, business, and educational organizations. Fees range from $6 to $20 per hour, depending on the database.

Guidebooks like the *Omni Online Database Directory* can help you locate the databases you need from these large information services or from smaller vendors.

Conducting a database search is an art, and it might take several tries to extract the information you want. In most cases the information service has software that searches for certain key words in a particular database. For instance, suppose you logged onto Knowledge Index to find articles about automated bank tellers indexed in its business-information database. You would tell Knowledge Index to search for abstracts including the word "bank." To narrow the search, you'd also tell it to report only abstracts that also contained words beginning with "auto." That would pull in words like "automatic," "automated," and "automation."

If you want to read the full text of one of the articles, Knowledge Index will send you a copy for $4.50 per article, plus $.20 per page photocopied.

This wealth of information can be overwhelming at times, so you might want help from a human librarian.

Knowledge Index employs a librarian who will help you design your searches. You can reach her on a toll-free line between 7 p.m. and 11 p.m. Eastern Time. For even more assistance, you can use Delphi's librarians, who for an hourly fee will conduct a Dialog search for you and put the results in your Delphi mailbox. Delphi is able to provide this service because it has a "gateway" to Dialog, that is, it allows you to use Dialog databases while you're logged on to Delphi. You pay Dialog's regular daytime rates plus the Delphi connect-time charge for this gateway service.

SHOPPING AND BANKING

In the last century, the Sears Roebuck catalog gave rural Americans a chance to buy dry goods and tools without making a long trip into the nearest city.

Today, although most of us live within a short distance of well-stocked department stores and specialty shops, shopping and banking via computer and phone lines has a similar allure: convenience.

Are you too busy to stop at the store to buy your wife that watch for her birthday? Would you like to check on your current bank balance at any time, even when

FOR FURTHER INFORMATION

If you'd like to learn more about the information services mentioned in this article, you can contact:

National Information Services

BRS After Dark
Bibliographic Retrieval Service
1200 Route 7
Latham, NY 12110
(518) 783-1161, (800) 833-4707
REGISTRATION FEE: $50
CONNECT-TIME FEES: between $6 and $20 per hour, depending on database used

Compuserve Consumer Information Service
5000 Arlington Center Blvd.
Columbus, OH 43220
(614) 457-8600, (800) 848-8199 (except in Ohio)
REGISTRATION FEE: $19.95 to $39.95 depending on amount of connect-time included
CONNECT-TIME FEES: weekdays—300 baud: $12.50 per hour, 1200 baud: $15 per hour; evenings and weekends—300 baud: $6 per hour, 1200 baud: $12.50 per hour

Compuserve Executive Information Service
5000 Arlington Center Blvd.
Columbus, OH 43220
(614) 457-8600, (800) 848-8199 (except in Ohio)
REGISTRATION FEE: $89.95
CONNECT-TIME FEES: same as Compuserve Consumer Information Service

Delphi
General Videotex Corp.
3 Blackstone St.
Cambridge, MA 02139
(617) 491-3393, (800) 544-4005
REGISTRATION FEE: $49.95
CONNECT-TIME FEES: weekdays: $16 per hour, evenings and weekends: $6 per hour; no extra charge for 1200-baud service

Dow Jones News/Retrieval Service
Dow Jones and Company Inc.
POB 300
Princeton, NJ 08540
(609) 452-1511, (800) 257-5114 (except in New Jersey)
REGISTRATION FEE: $75
CONNECT-TIME FEES: prime time (6 a.m. to 6 p.m. EST)—300 baud: between $24 and $72 per hour depending upon database and subscription plan, 1200 baud: between $48 and $144 per hour; nonprime time (6:01 p.m. to 4 a.m. EST)—300 baud: between $7.80 and $54 per hour, depending upon database and subscription plan, 1200 baud: between $15.60 and $108 per hour

Electronic Information Exchange System (EIES)
New Jersey Institute of Technology
Computerized Conferencing and Communications Center
Newark, NJ 07102
(201) 645-5211
REGISTRATION FEE: $75 per month
CONNECT-TIME FEES: communications charges only, between $3 and $9.50 per hour, depending on network used and time of day

Knowledge Index
Dialog Information Services Inc.
3460 Hillview Ave.
Palo Alto, CA 94304
(415) 858-3796, (800) 528-6050, (800) 352-0458 for Arizona, (800) 528-0470 for Alaska and Hawaii
REGISTRATION FEE: $35
CONNECT-TIME FEE: $24 per hour

The Source
Source Telecomputing Corp.
1616 Anderson Rd.
McLean, VA 22102
(703) 734-7500, (800) 336-3366
REGISTRATION FEE: $100
CONNECT-TIME FEES: weekdays—300 baud: $20.75 per hour, 1200 baud: $25.75 per hour; evenings and weekends—300 baud: $7.75 per hour, 1200 baud: $10.75 per hour

Local Area Services

Buy-Phone
POB 29307
Los Angeles, CA 90029
(213) 474-2220

Gamemaster
Suite 219, 1723 Howard St.
Evanston, IL 60202
(312) 328-9009
REGISTRATION FEE: $15
CONNECT-TIME FEE: $3 per hour

the bank is closed? Then computer shopping and banking may be for you.

Compuserve, Dow Jones, Delphi, and The Source all offer access to Comp-U-Store, an on-line catalog-shopping service of Comp-U-Card of America. After you pay your yearly Comp-U-Store membership fee, you can browse through descriptions of some 50,000 products, including clothing, athletic equipment, cameras and electronic equipment, furniture, appliances, and even cars. You can use Comp-U-Store to do some comparison shopping, or you can enter your orders on-line, paying by

***THE** department store of the on-line world, Comp-U-Store lists descriptions of some 50,000 products*

credit card or by check. Unlike conventional catalogs, Comp-U-Store doesn't provide pictures of the merchandise, so if you place an order, you must be sure of the name and model you want.

Comp-U-Store is the department store of the on-line world, but there are specialty shops as well. For instance, you can order books on scientific topics from The Professional Book Center and buy records, tapes, and cassettes from Musicsource on The Source; for sporting goods, check out The Athlete's Outfitter on Compuserve. Delphi and Compuserve let you buy securities from on-line stockbrokers. You can shop the on-line version of the classified ads on Compuserve, Delphi, or The Source. Mail-order shoppers will delight in Catfax, Dialog's directory of more than 4000 mail-order catalogs. And flea-market addicts can browse and barter on The Source's Tradenet, a listing of goods and services.

On-line banking is beginning to pick up in popularity, with Compuserve and Delphi both allowing you to open accounts with participating banks. You can pay many of your bills by entering on-line commands, without ever having to put pen to checkbook. You can see your balance whenever you like and in some cases transfer funds between accounts.

Outside the national information services, individual banks have started to introduce their own on-line banking services. For example, in January, California's Bank of America began offering Homebanking accounts for a monthly fee of $8 over and above the regular checking account fees.

Though incredibly diverse, the world of on-line services for home computers is still young. Even as you begin your voyage of discovery, new features will emerge, and others will disappear. In a few years the landscape may look quite different, but if you begin now, you can participate in the changes. It's an exciting time to embark on your trip. □

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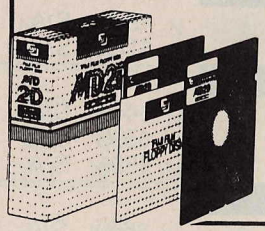
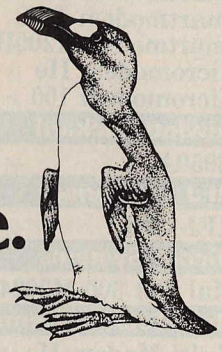


INTRODUCTORY OFFER

And then there were none.



The list of already extinct animals grows . . . the great auk, the Texas gray wolf, the Badlands bighorn, the sea mink, the passenger pigeon . . .

What happens if civilization continues to slowly choke out wildlife species by species?

Man cannot live on a planet unfit for animals.

Join an organization that's **doing** something about preserving our endangered species. Get involved. Write the National Wildlife Federation, Department 105, 1412 16th Street, NW. Washington, DC 20036.

It's not too late.

MODEM COMPARISON CHART

CONTINUED FROM PAGE 117

	PRICE	CONFIGURATION	LINE CONNECTION	INTERFACE	DIALING	BAUD RATE
Bizcomp						
Model 1012	$549	S/A	direct	RS-232	both	0-1200
Model 1022	$279	S/A	direct	RS-232	both	0-300
PC:IntelliModem	$499	card	direct	IBM-compatible	both	110, 300, 1200
Cermetek Microelectronics						
Info-Mate 212 PC	$480	card	direct	IBM-compatible	both	110-1200
Info-Mate 212 A	$595	S/A	direct	RS-232	both	110-1200
Codex						
5212/ACU	$645	S/A	direct	RS-232	both	0-1200
224	$995	S/A	direct	RS-232	NA	1200, 2400
2232	$1195	S/A	direct	RS-232	both	1200, 2400
Coherent Communications						
SPM-94A	$475	S/A	direct	RS-232	both	0-300
SPM-94B	$570	S/A	direct	RS-232	both	0-300
Concord Data Systems						
CDS 224	$995	S/A	direct	RS-232	both	1200, 2400
CDS 224 Autodial	$1195	S/A	direct	RS-232	both	1200, 2400
Datec						
Pal 212	$449	S/A	direct	RS-232	both	0-300, 1200
Pal Plus	$599	card	direct	IBM-compatible	both	0-300, 1200
212	$595	S/A	direct	RS-232	both	0-300, 1200
Develcon Electronics						
8212	$650	S/A	direct	RS-232	both	0-1200
Gandalf Technologies						
SAM 212A	$618	S/A	direct	RS-232	both	0-1200
SAM 201	$725	S/A	direct	RS-232	both	1200, 2400
Hayes Microcomputer Products						
Smartmodem 300	$289	S/A	direct	RS-232	both	0-300
Smartmodem 1200	$699	S/A	direct	RS-232	both	0-1200
Smartmodem 1200B	$539	card	direct	RS-232, IBM-compatible	both	0-1200
Micromodem IIe	$289	card	direct	Apple-compatible	both	0-300
Micromodem 100	$399	S/A	direct	S-100	both	110, 300
Hewlett-Packard						
82950A	$395	card	direct	Series 80	NA	110-300
MFJ Enterprises						
MFJ-1233	$129	S/A	acoust/dir	RS-232, TTL, CMOS	NA	0-300
Micom Systems						
Dial Net 300-M3024	$795	S/A	direct	RS-232	both	1200, 2400
Multi-Tech Systems						
Multi-Modem IIe	$329	card	direct	Apple-compatible	both	110, 300
Multi-Modem HC	$549	S/A	direct	RS-232	both	300, 1200
Multi-Modem	$549	S/A	direct	RS-232	both	300, 1200
Multi-Modem PC	$549	card	direct	IBM-compatible	both	300, 1200
Novation						
Cat	$189	S/A	acoustic	RS-232	NA	0-300
D-Cat	$199	S/A	direct	RS-232	NA	0-300
J-Cat	$149	S/A	direct	RS-232, TTL	NA	0-300
212 Auto-Cat	$695	S/A	direct	RS-232	both	0-1200
103 Smart-Cat	$249	S/A	direct	RS-232	both	110, 300
103/212 Smart-Cat	$595	S/A	direct	RS-232	both	300, 1200
Apple-Cat II	$319	card	direct	Apple-compatible	both	0-300, 1200
212 Apple-Cat II	$595	card	direct	Apple-compatible	both	0-300, 1200
Access 1-2-3	$595	card	direct	IBM-compatible	both	300, 1200
Prentice						
Popcom X100	$475	S/A	direct	RS-232	both	0-300, 1200

COMMUNICATIONS MODE	DATA FORMAT	VOICE/DATA SWITCH	AUTOMATIC FEATURES											
			ANSWER	DIAL	REDIAL	LOG-ON	PROTOCOL DETECT/SWITCH	DIALING DIRECTORY	NUMBER CHAINING	ANSWER-BACK STRING	LINE-SOUND MONITORING	SELFTEST	LINE TEST	BUNDLED SOFTWARE
both	both	none	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	
both	async	none	Y	Y	Y	Y	Y	N	N	Y	Y	Y	N	
both	async	simul.	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	
both	async	none	Y	Y	Y	Y*	Y	Y*	Y	N	Y	Y	Y	Modem Mate
full	both	none	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
full	both	manual	Y	Y	Y	N	Y	Y	Y	N	N	Y	Y	Software integral
full	both	manual	Y	Y	NA	N	Y	Y	NA	N	Y	Y	Y	
full	both	manual	Y	Y	Y	N	N	Y	Y	N	Y	Y	Y	
half	async	manual	N	N	N	N	N	N	N	N	N	Y	Y	
full	async	simul.	N	N	N	N	N	N	N	N	N	Y	Y	
full	both	manual	Y	N	N	N	Y	N	N	N	N	Y	Y	
full	both	none	Y	Y	Y	Y	N	N	Y	N	N	Y	Y	
both	async	manual	Y	Y	Y	N	Y	N	N	N	Y	Y	N	
full	async	none	Y	Y	Y	Y*	Y	Y*	Y*	Y*	Y	N	N	Crosstalk XVI
both	both	manual	Y	Y	N	N	Y	Y	N	N	N	Y	Y	
full	both	none	Y	Y	Y	N	Y	Y	N	N	N	Y	Y	
full	both	none	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	
both	both	manual	Y	N	N	N	N	N	N	N	N	Y	Y	
both	async	none	Y	Y	Y	N	N	N	N	N	Y	Y	N	
both	async	none	Y	Y	Y	N	Y	N	N	N	Y	Y	N	
both	async	none	Y	Y	Y	N	N	N	N	N	Y	Y	N	
both	async	none	Y	Y	Y	N	N	N	N	N	Y	Y	N	
both	async	none	Y	Y	Y	N	N	N	N	N	N	N	N	
full	async	none	Y	Y	Y	Y	Y	Y	N	N	N	Y	N	
full	async	manual	N	N	N	N	N	N	N	N	N	Y	N	
full	both	manual	Y	N	N	N	Y	N	N	N	N	Y	Y	
both	async	auto	Y	Y	Y*	Y*	N	Y*	N	Y	Y	Y	Y	Multi-Com II
both	async	auto	Y	Y	Y	N	Y	N	N	N	Y	Y	N	
both	async	auto	Y	Y	Y	N	Y	Y	Y	N	Y	Y	N	
both	async	auto	Y	Y	N	Y*	Y	Y*	N	Y*	Y*	Y	N	Multi-Com PC
both	async	none	N	N	N	N	N	N	N	N	N	Y	N	
both	async	manual	N	N	N	N	N	N	N	N	N	Y	N	
full	async	none	N	N	N	N	N	N	N	N	N	Y	N	
full	both	auto	N	Y	N	N	Y	N	N	N	N	Y	Y	
both	async	auto	Y	Y	Y	N	Y	N	N	N	N	Y	Y	
both	async	auto	Y	Y	Y	N	N	N	N	N	N	Y	Y	
both	async	manual	Y	Y	Y	N	Y*	Y*	N	Y*	Y*	Y*	Y*	Com-Ware II
both	async	manual	Y	Y	Y	N	Y*	Y*	N	Y*	Y*	Y*	Y*	Com-Ware II
full	async	auto	Y	Y	Y	Y*	Y	Y*	N	N	Y	Y	Y	Crosstalk XVI
full	async	auto	Y	Y	Y	N	N	N	N	N	Y	Y	Y	

*This feature is a function of the bundled software

MODEM COMPARISON CHART

CHART CONTINUED FROM PAGE 159

	PRICE	CONFIGURATION	LINE CONNECTION	INTERFACE	DIALING	BAUD RATE
Rixon						
R103J	$249	S/A	direct	RS-232	both	0-300
R212A	$499	S/A	direct	RS-232	both	0-300, 1200
PC212A	$499	card	direct	IBM-compatible	both	0-300, 1200
R2424	$1395	S/A	direct	RS-232	both	1200, 2400
Radio Shack						
TRS-80 Modem IB	$100	S/A	direct	TRS-80 RS-232	NA	300
TRS-80 Modem II	$200	S/A	direct	TRS-80 RS-232	both	0-300
4P Modem Board	$150	card	direct	TRS-80 RS-232	both	0-300
Tri-Data						
Oz Guardian 533	$750	S/A	direct	RS-232	both	110-1200
Tymshare						
921	$449	S/A	direct	RS-232	NA	300, 1200
923	$495	S/A	direct	RS-232	both	300, 1200
925	$625	S/A	direct	RS-232	both	300, 1200
927	$495	card	direct	IBM-compatible	both	300, 1200
Universal Data Systems						
103 O/ALP	$145	S/A	direct	RS-232, TTY	NA	0-300
103-J LP	$195	S/A	direct	RS-232	NA	0-300
202 LP	$195	S/A	direct	RS-232	NA	0-1200
202-S LP	$245	S/A	direct	RS-232	NA	0-1200
212 LP	$445	S/A	direct	RS-232	NA	1200
212 A/D	$645	S/A	direct	RS-232	both	0-300, 1200
212 A	$595	S/A	direct	RS-232	NA	0-300, 1200
U.S. Robotics						
Phone Link	$189	S/A	acoustic	RS-232	both	0-300
Password	$449	S/A	direct	RS-232	both	0-1200
IBM Personal Communicator	$449	card	direct	IBM-compatible	both	0-1200
IBM Personal Communicator 64K	$699	card	direct	IBM-compatible	both	0-1200
IBM Personal Communicator 256K	$999	card	direct	IBM-compatible	both	0-1200
Auto Dial 212A	$599	S/A	direct	RS-232	both	0-1200
S-100	$449	card	direct	S-100	both	0-300, 1200
Auto Link 212A	$549	S/A	direct	RS-232	both	0-1200
Auto Link 1200	$499	S/A	direct	RS-232	both	1200
Micro Link 1200	$449	S/A	direct	RS-232	both	1200
Auto Link 300	$269	S/A	direct	RS-232	both	0-300
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THE CASE FOR 300 BAUD

In an age of rapidly advancing computer technology, it's ironic that some products boasting improved capabilities do not necessarily offer tangible benefits or savings to the home user. Take the modem, for example. Because it expands the capabilities of a computer by allowing it to double as a communications terminal, a modem is one of the first accessories many users want to add to their machines. And because a 1200-baud modem can transmit and receive information four times faster than a 300-baud unit, the prospective buyer is likely to see the faster modem as representing potential savings in connect charges and operator time. Faster must be better, right?

Not necessarily. Depending on the application, using a 1200-baud modem can actually *increase* the costs associated with on-line activities such as accessing a database or sending and receiving electronic mail; 1200-baud transmission is often more than you can take advantage of.

No one can type at the rate of 120 characters per second (the equivalent character-transmission rate of 1200 baud). Therefore, it makes little sense to pay 1200-baud transmission rates, which can be as much as three times more expensive than the rates for 300-baud transmissions. Dow Jones charges exactly twice as much to connect to its systems at 1200 baud—$144 per hour versus $72 per hour. If you're going to check a few stock prices, it would certainly be less expensive to get the information at 300 baud.

Even systems that offer electronic-mail services charge more when transmission speeds exceed 30 characters per second—the approximate equivalent of 300

COMMUNICATIONS MODE	DATA FORMAT	VOICE/DATA SWITCH	AUTOMATIC FEATURES: ANSWER	DIAL	REDIAL	LOG-ON	PROTOCOL DETECT/SWITCH	DIALING DIRECTORY	NUMBER CHAINING	ANSWER-BACK STRING	LINE-SOUND MONITORING	SELFTEST	LINE TEST	BUNDLED SOFTWARE
full	async	manual	Y	N	N	N	N	N	N	N	N	Y	N	
full	async	none	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	
full	async	none	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Setmodem
full	both	manual	Y	Y	N	N	N	N	N	N	N	Y	Y	
full	async	manual	N	N	N	N	N	N	N	N	N	N	N	
both	async	none	Y	Y	N	N	N	N	N	N	N	Y	Y	
both	async	none	Y	Y	N	N	N	N	N	N	N	Y	Y	
full	async	none	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	
both	both	manual	Y	N	N	N	N	N	N	N	N	Y	Y	
both	async	none	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	
both	async	none	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
both	async	none	Y	Y	Y	Y*	Y	Y*	Y*	N	Y	Y	Y	Crosstalk XVI
full	async	manual	N	N	N	N	N	N	N	N	N	N	N	
full	async	manual	Y	N	N	N	N	N	N	N	N	N	N	
half	async	manual	N	N	N	N	N	N	N	N	N	N	N	
half	async	manual	Y	N	N	N	N	N	N	N	N	N	N	
full	async	manual	N	N	N	N	N	N	N	N	N	N	N	
full	both	manual	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	
full	both	manual	Y	N	N	N	Y	N	N	N	N	Y	Y	
both	async	none	N	N	N	N	N	N	N	N	N	Y	N	
both	async	manual	Y	Y	N	Y	Y	N	N	N	Y	Y	Y	
both	async	manual	Y	Y	Y*	Y*	Y*	Y*	N	Y*	Y	N	N	Telepac
both	async	manual	Y	Y	Y*	Y*	Y*	Y*	N	Y*	Y	N	N	Telepac
both	async	manual	Y	Y	Y*	Y*	Y*	Y*	N	Y*	Y	N	N	Telepac w/print buffer
both	async	manual	Y	Y	N	Y	Y	N	N	N	Y	Y	Y	
both	async	manual	Y	Y	N	N	Y	N	N	N	Y	N	N	
both	async	manual	Y	N	N	Y	Y	N	N	N	Y	Y	Y	
both	async	manual	Y	N	N	Y	Y	N	N	N	Y	Y	Y	
both	async	manual	N	N	N	Y	Y	N	N	N	Y	Y	Y	
both	async	none	Y	N	N	Y	Y	N	N	N	Y	Y	Y	
both	async	none	N	N	N	Y	Y	N	N	N	Y	Y	Y	

baud. For instance, Western Union's Easylink electronic-mail service charges $1.20 per minute to send a domestic Telex message at 300 baud and $4.50 per minute at 1200 baud. Typically, Telex messages are very brief, usually between 50 and 100 words in length. A typist capable of generating 50 words per minute would incur an approximate charge of $1.20 to send a 50-word message at 300 baud via Easylink; the same typist sending the same message at 1200 baud would run up a $4.50 tab.

Of course, sending data at the fastest possible rate does make sense in many telecommunications applications. In the very large data networks that move tremendous amounts of information and link giant computers between insurance companies, banks, airlines, and other industries, even 1200 baud is considered a slow transmission speed. The modems used to transfer immense files in such environments generally operate at speeds of 4800 baud or more. But in the world of personal computers, few users really need to transfer files of any significant length.

In addition to the fact that most on-line systems charge more for 1200-baud use, you should also consider that the hardware itself is more expensive. A 1200-baud modem will typically cost at least twice as much as a modem capable of only 300-baud transmission. And a final consideration, especially if you will spend most of your connect time in an interactive, conversational mode, is that text received at the rate of 300 baud is much easier to read as it is displayed on your computer's screen.

After examining your own applications and requirements, you may well discover that when it comes to selecting a modem, faster is really only faster, not better.

—Jennifer Hemmes

*This feature is a function of the bundled software.

COMMUNICATIONS SOFTWARE BUYER'S GUIDE

CONTINUED FROM PAGE 128

	OPERATING SYSTEMS	FILE-TRANSFER PROTOCOLS	BAUD RATES
United Software Industries ASCII Express "The Professional"	Apple DOS 3.3	XON/XOFF, XMODEM	50-9600
Dynamic Microprocessor Associates ASCOM	MS-DOS, PC-DOS, CP/M-80, CP/M-86	XON/XOFF, XMODEM, Line Transmit (TTY), BLOCK, BLOCK V	110-38,500
IBM Asynchronous Communications Support	PC-DOS	XON/XOFF	75-9600
Hawkeye Grafix COMMX-PAC	CP/M, CP/M-86, MS-DOS, TurboDOS	XON/XOFF, XMODEM, Prompted transmission, COMMX CRC-16, SIXPAC	300-9600
Microstuf Inc. Crosstalk XVI	MS-DOS, PC-DOS	XON/XOFF, XMODEM, Crosstalk	110-9600
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Southeastern Software Data Capture IIe, Data Capture 5.0	Apple DOS 3.3	XON/XOFF	110-1200
Link Systems Datalink	Apple Pascal (version 1.1 or later)	XON/XOFF, STX-ETX, ACK-NACK, LRCC	110-4800
IBM Personal Communications Manager	PC-DOS	XON/XOFF	110-9600
Norton-Lambert Corp. LYNC	Apple DOS, CP/M, CP/M-86, PC-DOS, MS-DOS, TurboDOS	XON/XOFF, XMODEM, LYNC, Send lines protocol	110-19,200
Mycroft Labs MITE	CP/M, CP/M-86, Concurrent CP/M-86, MS-DOS	XON/XOFF, XMODEM, XMODEM BATCH, XMODEM/CRC, MITE, CLINK (Crosstalk), Hayes, IBM Async protocol	50-19,200
Mark of the Unicorn PC/InterComm	PC-DOS, MS-DOS on Zenith Z-100	XON/XOFF, XMODEM	50-19,200
The Headlands Press PC-Talk III	MS-DOS	XON/XOFF, XMODEM	75-9600
Perfect Software Perfect Link	MS-DOS, PC-DOS	XON/XOFF, XMODEM	300-1200
Software Publishing Corp. PFS:Access	MS-DOS, Apple DOS	XON/XOFF	110-1200
Hayes Microcomputer Products Smartcom I	Apple DOS 3.3, Pascal, CP/M	XON/XOFF, Verification protocol, Send lines protocol	110 and 300
Hayes Microcomputer Products Smartcom II	MS-DOS	XON/XOFF, Verification protocol, Send lines protocol	110-9600
Small Business Systems Group ST80-III	TRSDOS, CP/M, NEWDOS-80, LDOS, DOSPlus	CKSUM	110-9600
Peachtree Software Telecommunications	MS-DOS, CP/M	XON/XOFF, CRC	110-9600
Exec Software TermExec	Apple DOS	XON/XOFF, XMODEM, BLOCK	110-1200
Windmill Software Videolink 88	MS-DOS, PC-DOS	XON/XOFF	75-1200

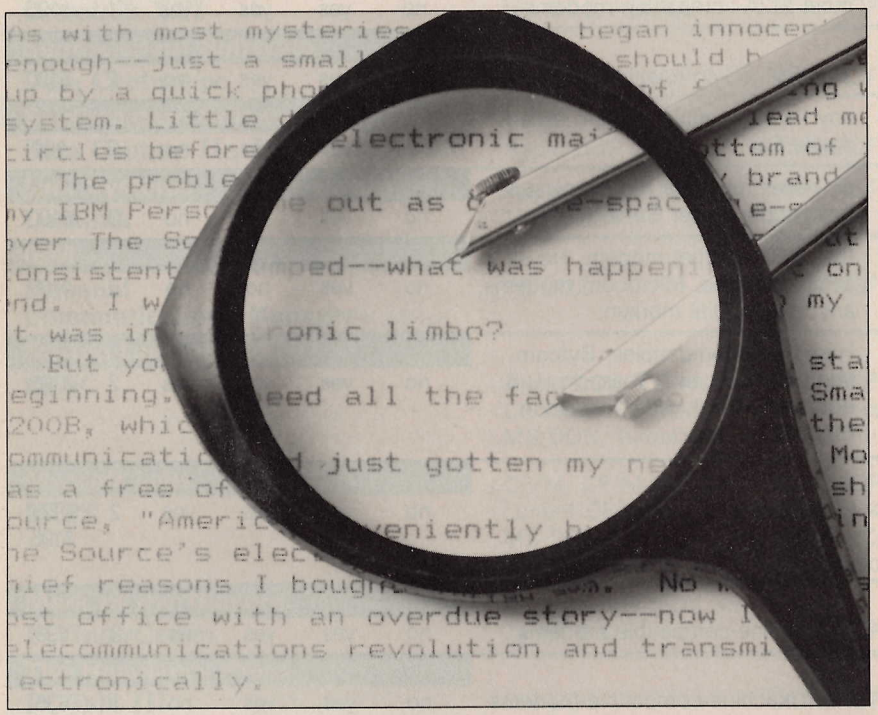
FILE TYPES	CAPTURE METHOD	MODEMS SUPPORTED	FILE EDITING?	MACRO CAPABILITY?	INCLUDES ON-LINE TUTORIAL?	UNATTENDED OPERATION?	DOCUMENT RATING	PRICE
all DOS file types	buffer and disk	all Apple-compatible modems	yes	yes	yes	yes	1	$130
all file types	buffer and disk	any modem	no	yes	yes	yes	4	$195
text	buffer and disk	full-duplex modems	no	no	no	no	2	$60
text and binary	buffer and disk	smartmodems and acoustic modems	no	yes	yes	yes	3	$150
text and binary	buffer and disk	most 212A-compatible modems	no	yes	yes	yes	1	$195
text	buffer and disk	any IBM PC-compatible modem	yes	yes	yes	no	2	$120
text	buffer	any IIe-compatible modem except Apple-Cat	yes	yes	yes	no	3	$90
text and binary	buffer	all Hayes modems (does not support Apple Super Serial Card)	no	yes	no	no	3	$100
any DOS files	buffer and disk	IBM PCjr internal modem, Hayes Smartmodems, Microcom modems, any manual-dial modem	no	yes	no	no	2	$100
all file types	buffer	Hayes and compatibles, Bytcom, Ventel, Microbaud, Passport, U.S. Robotics, Racal Vadic, Novation, Bizcomp	no	yes	yes	yes	2	$195
all file types	buffer and disk	all modems	no	yes	yes	yes	2	$150/ $195
text and binary	buffer and disk	all machine-compatible modems	no	yes	yes	no	3	$99
text and binary	disk	most machine-compatible modems	no	yes	yes	no	1	$35
text and binary	disk	all RS-232 serial modems	no	yes	yes	no	1	$149
text, PFS:Write, and PFS:Report files	buffer and disk	most machine-compatible modems	no	yes	yes	no	2	$95/ $70
text and binary	disk	Micromodem II and IIe	no	no	no	no	3	$119
text	buffer and disk	Hayes Smartmodem III, 1200, and 1200B	yes	yes	yes	no	4	$149
text and binary	buffer	most smartmodems and acoustic modems	no	yes	yes	no	3	$150/ $250
text and binary	buffer	all RS-232 serial modems	no	no	yes	yes	2	$150
all Apple DOS files	disk	most Apple-compatible modems	yes	yes	yes	yes	2	$80
text and binary	disk	Hayes, Novation, and compatibles	no	yes	yes	no	2	$60

RANDOM ACCESS

A wide-ranging look at ways to get more from your personal computer

The Case of the Redundant Linefeed Page 164

Dealing with Data Loss: Prevention and Recovery Page 169



The Case of the Redundant Linefeed

As with most mysteries, it all began innocently enough—just a small glitch that should have been cleared up by a quick phone call or a bit of fiddling with the system. Little did I know that it would lead me around in circles before I finally got to the bottom of it.

The problem was this: I was using my brand-new modem and my IBM Personal Computer to send a single-spaced letter over The Source's electronic mail service, but the letter consistently came out as double-spaced text on the other end. I was stumped—what was happening to my letter while it was in electronic limbo?

But you'll need all the facts, so let's start from the beginning. I had just installed my new Hayes Smartmodem 1200B, which was conveniently bundled with the Hayes communications program called Smartcom II. Moreover, there was a free offer I couldn't refuse—a membership in The Source, "America's Information Utility." Gaining access to The Source's electronic mail service had been one of the chief reasons I bought the modem. No more dashing to the post office with an overdue story—now I would join the telecommunications revolution and transmit my copy electronically.

Without much ado, I signed up and began exploring the possibilities of electronic mail. I read the software and hardware manuals, followed the instructions, and soon the words "Welcome to The Source" flashed across my screen.

Following The Source's menu-based prompts, I requested information on how to use the electronic mail service. It seemed that nothing could be easier. To send a letter, all I had to do was type MAIL S and then enter the account number of my correspondent. When prompted for the text of my message, I would simply tell the Smartcom II communications software to transmit the appropriate file. After sending the file on its way, I would type .S to signal to The Source that the message had been entered. The Source would then confirm the transmission by reporting that the letter had been sent.

The Mystery Unfolds

I decided to experiment by sending some letters to myself. Every-

Photograph by Dennis Warnesky

thing worked like a charm, except for one little detail—the single-spaced text that I sent had been mysteriously transformed into double-spaced text before it came back to me.

My first thought was that The Source was adding an extra linefeed character to each line of my text. The linefeed is a control code that sends the cursor to the next line. My IBM PC includes both a linefeed and a carriage return at the end of each line. The linefeed spaces down a line and the carriage return moves the cursor to the left margin. But some computers (such as the Apple II) insert only a carriage return at the end of each line. Thus, I reasoned that perhaps The Source adds an extra linefeed to each line just to make sure lines aren't printed on top of each other.

I was already imagining myself saying, "Elementary, my dear readers," but I figured I'd better test my theory first. I wrote a quick BASIC program to remove all of the linefeeds from a sample letter, expecting it to come back single-spaced. But when I sent the modified text to myself, the letter *still* came back double-spaced. Now I was really stumped.

A Simple Solution?

When in doubt, read the directions, they always say, so I turned to the "Troubleshooting" section of the Smartcom II manual. Scanning columns of typical symptoms I came upon my problem stated succinctly: "Lines of text appear double-spaced." The manual confirmed my suspicions—The Source does indeed automatically insert an additional linefeed after the carriage return. The solution, the manual advised, was to instruct Smartcom II to wait briefly whenever it sends a carriage return. If the remote system sends a linefeed, Smartcom II, living up to its name, will know not to send the linefeed in the text.

Was the mystery solved? Could it be that simple? Was this the computer equivalent of "the butler did it"? No, indeed. Like any real mys-

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tery, this case has a twist.

I followed the manual's directions, changed the specified Smartcom II parameter, and signed on to The Source to see if my single-spaced letter would now stay that way. No such luck. Most of the lines were single-spaced, but every 12 lines or so an extra space would sneak in. This was even worse than before. My correspondent might believe I had sent a double-spaced letter on purpose, but this erratic spacing would be sure to create a bad impression.

What now? I decided to narrow down the suspects by switching to PC-Talk III, another communications program for the IBM PC. PC-Talk III, you see, handles linefeeds differently from Smartcom II.

While browsing through PC-Talk's manual, I discovered an important clue. In the section explaining how to send files to The Source via Telenet or Tymnet (telecommunication services that provide a local number for connecting to The Source), the manual said, "Depending on how heavily the system is being used, you may find it necessary to pace transmission with a 2- or 3-second delay between lines to make sure that your file is properly received by the remote system." To this end PC-Talk III offers a feature called "pacing," which allows you to specify a time delay at the end of each line. The pacing feature also strips linefeeds from your file.

Here was a real lead. Perhaps my 1200-baud modem was sending files faster than my Tymnet connection could handle. I called Andrew Fluegelman, author of PC-Talk, to see if I was on the right track.

Fluegelman explained that many mainframe computers, including the ones that control The Source, are incapable of communicating at "true 1200 baud." When traffic on the communications networks is heavy, the system runs at a considerably slower rate. Thus, if you try to send a document at 1200 baud, you're likely to encounter extra linefeeds, lost characters, and other puzzling results. It was to circumvent problems like these that Fluegelman added the pacing feature to PC-Talk.

So I gave it a try. Using PC-Talk III and a 1-second delay between lines, I was at last able to send a single-spaced letter and have it stay that way. I then tried a similar approach with Smartcom II, telling the program to wait for the linefeed from The Source and also to delay each line by 1 second. My problem disappeared!

Who's the Culprit?

But I still didn't feel that the mystery was solved, even though the problem was. I wanted to know "who done it." If this were a novel, I could assemble all of my suspects in the library and startle the guilty one into a confession. But I'm only an intrepid computerist, not a mystery writer, so the best I could do was call all of the companies involved to see if anyone knew just where those extra linefeeds came from in the first place.

First I talked to Mukhtar Khan, customer relations supervisor for The Source. He thought that Smartcom II was at fault. The Source's Prime mainframe echoes back to your computer each line you send, and at the end of each line it sends a series of "null lines," or ASCII 0s, to create linefeeds. Most communications software will sense only one of the null lines, Khan said, but Smartcom II will read two of them unless you slow down the file transfer. And regarding the dropped characters that Fluegelman and his friends experienced, Khan feels that noise on the telephone lines is at fault. High transmission speed, he said, will multiply any noise errors. If you lose 1 bit at 300 baud, you'll lose 4 bits at 1200 baud.

Hayes Microcomputer Products tells a different story. A company spokesman who disagreed with Khan said Smartcom II doesn't even react to null lines sent by remote computers. The null lines, he said, were to accommodate slow teleprinters that needed time to complete a carriage return. After checking with the gurus in the programming department, the Hayes spokes-

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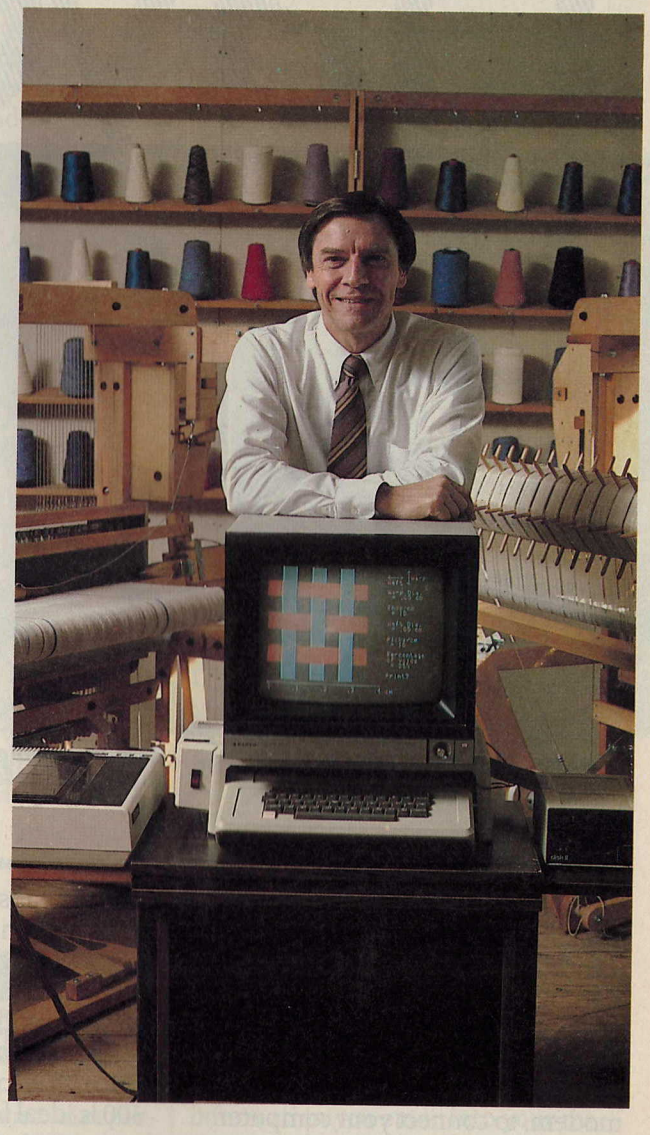

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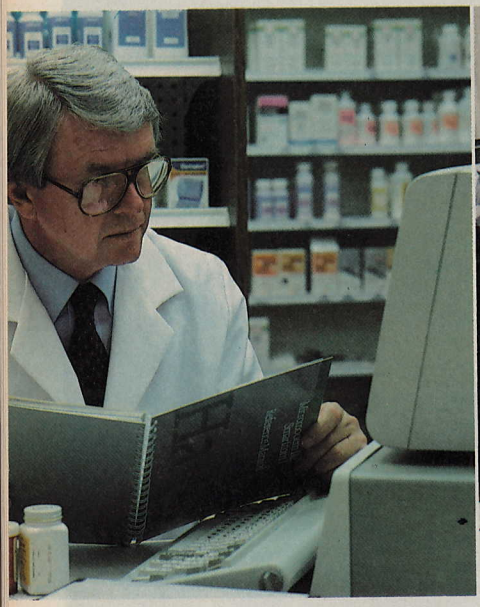
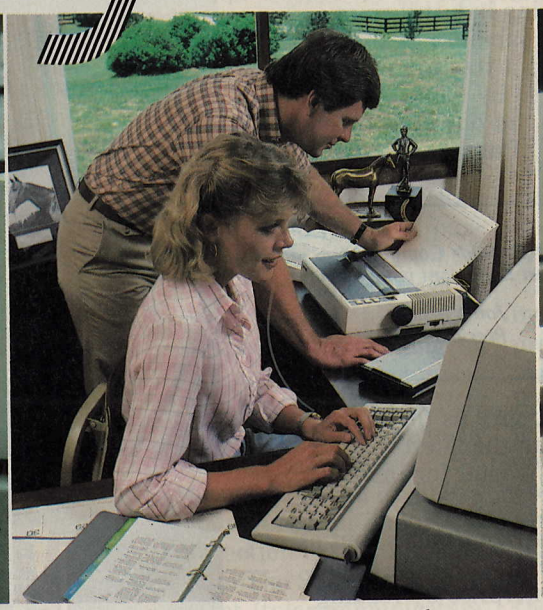
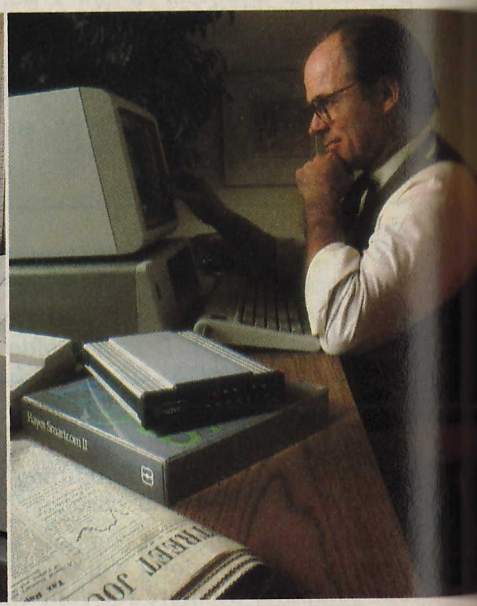


What are the adverse effects of this compound?



Gary: The pedigrees for next week's auction are as follows...



Sold 1000 shares at 33 for net profit of 6000. Richard.

Wouldn't it be great if you could use your IBM* PC to tap into vast resource libraries across the country? To transfer files to your partner, upstate? Or from your broker, down the street?

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man suggested that the occasional extra linefeeds might be a local problem with my telephone exchange or with Tymnet. And indeed, when I logged onto The Source using Telenet, I found that I no longer had to slow down the file transfer.

Now I seemed to be zeroing in on the answer. But to make sure, I talked with Bob Workman, the supervisor of customer support for Tymnet. He explained that Tymnet, not The Source, was sending linefeeds at the end of each of my lines. Workman monitored one of my sessions with The Source so that everything I sent or received appeared on his screen. He concluded that Tymnet was doing its job, sending a linefeed at the end of each line, and that occasionally my computer sent a linefeed as well. He theorized that when Tymnet suffered a momentary delay, Smartcom II got impatient and sent a linefeed when it concluded that none would come from the remote system. He suggested that anyone communicating via Tymnet simply avoid sending any linefeeds at all.

As in most good mysteries, there are some morals to this story. One is that computer communications problems can be exceedingly difficult to track down. As Andrew Fluegelman noted about the complexities of getting two computers talking, "If there's a vulnerable spot in either of the two systems or in the communications link, the problem will show up on your screen."

The second moral is that if you don't have time to hunt for the definitive solution, you can often solve communications problems by slowing down the process. If all parts of the system, including phone lines and both computers, are in top form, then you can communicate at top speed. But, as Muhktar Khan pointed out, high-speed transmission can compound the problems caused by any weak points in the system.

—Dara Pearlman

Dealing with Data Loss: Prevention and Recovery

Few things are more exasperating that losing valuable computerized data, yet few disasters can happen more easily and with less warning. Sometimes it's simply a mistake on your part, such as deleting the wrong file, that causes your data to vanish. At other times a power surge or faulty disk unexpectedly robs you of data. Care on your part will make the data you enter into your computer more secure, and even if the worst does happen, some surprisingly inexpensive utility programs can frequently recover data files you thought were gone for good.

Understanding what data is and how your computer stores and accesses it is the first step in preventing data loss. Basically, data is any information you enter into your machine. It can be timeless prose entered with your word-processing program, financial information in a spreadsheet, or a computer program in any language. But to your computer it is all the same—a series of binary digits.

When you instruct your computer to store a data file on disk, it looks for the first available space on the disk and begins writing the data to the magnetic medium. Usually an entire file will fit into the open space on the disk, but if it won't, the machine jumps to the next available space and continues the file there. In cases where a file is split in this way, the final part of the first section includes the address of the beginning of the second section. In other

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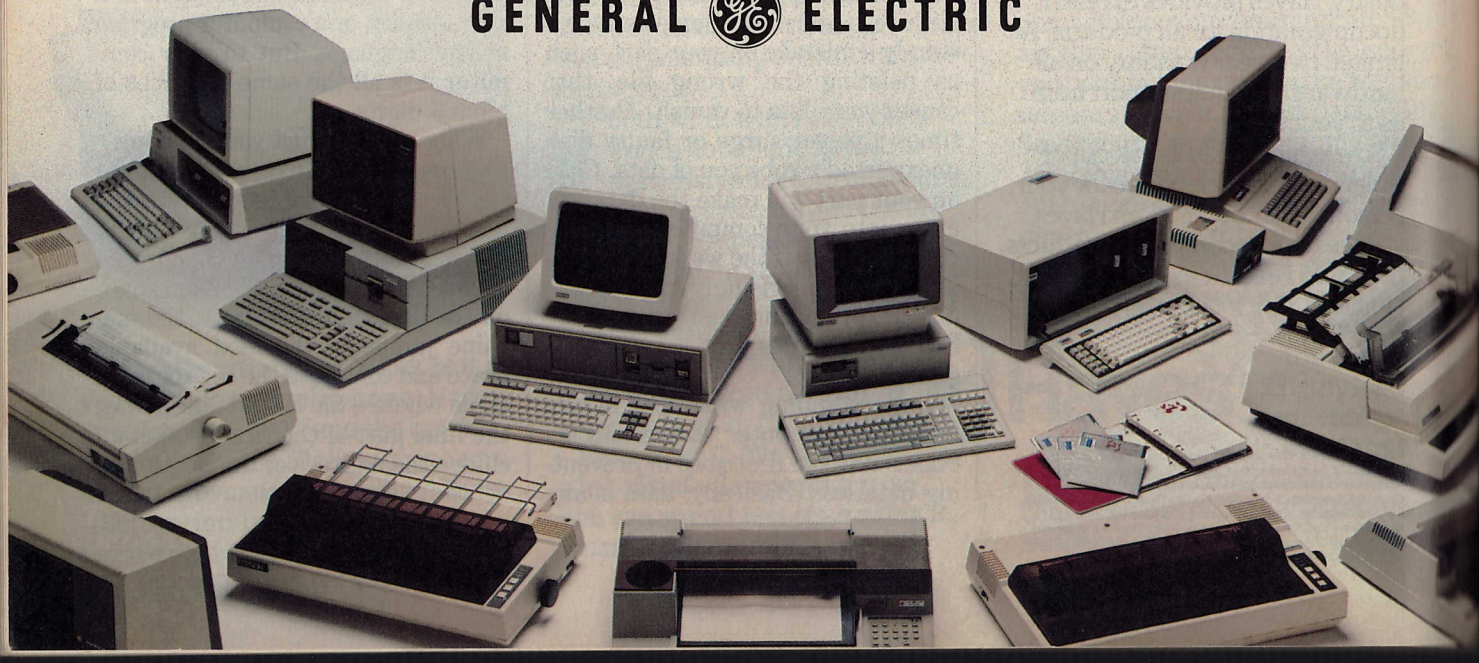

words, if your computer can find the beginning of the file you want, it should be able to find all of it.

Finding the beginning of any file is the key to data access. The computer does this by storing the name you give the file with the address where it begins. When you call up the file by name, the computer looks up the address of the file and copies the filed data into its internal memory.

The file name and address are stored internally in a table of contents, which is referenced by the disk directory. Your only link with the file is through this directory reference. If your file name isn't in the directory, or if the directory itself disappears, then on most computers you can access the actual data only with special software.

Not to belabor the obvious, but securing your data against loss is always preferable to trying to recover or reconstruct lost data. The information you enter into your computer is most vulnerable when it's in the machine's internal memory and no disk file has been made. Guard against losing such data by saving it on disk at frequent intervals.

Once your data is on disk, you should back up your files by copying them on a separate disk. Because such backups become less valuable every time you change the file, you'd do well to update them whenever you make significant modifications to the original. Also, you should make a hard copy of your data whenever you finish editing it—this won't prevent data loss, but it makes the reconstruction of a missing file much easier.

Recovering Lost Data

Naturally you'll try to do all the right things and have a current back-up file or disk. But what if something goes wrong before you're able to make a backup? In that case, you will have to either reconstruct data from an earlier backup and reenter the rest from your hard copy or recover your lost data using a data-recovery program.

Basically, a data-recovery program will find the missing links in your file structure and give you the means of once more accessing the data in that file. Sometimes you'll have a good disk with good data—only the file name is missing, probably because you accidentally deleted it. When you delete a file, you don't really erase it—you simply remove the file name from the directory. Until the old file is overwritten with new data, the old data should still be on the disk. All the recovery program needs to do is find the beginning of the file and let you set up a file name. At other times the problem will be more serious, sometimes requiring you to reconstruct the entire file.

Remember that while a data-recovery program can generally find a file whose name has been lost or deleted, it can't possibly find data that doesn't exist or that has been overwritten with new data. Programs designed to relocate missing data are helpful utilities, but they won't perform magic.

Most of the data-recovery programs available today are marketed as part of more comprehensive utility packages that typically offer many other useful capabilities. Such packages are often not featured by computer dealers, so you may get a blank stare when you ask about them. Below we list three utility packages that include data-recovery functions, and you may contact the distributors directly for more information. Also, your computer's manufacturer should be able to suggest other alternatives.

Basically, data-recovery programs and the other utilities that are packaged with them do their jobs by going into the operating system and working with its disk operations on a level that the user rarely gets to see. This low-level access means that such utilities are able not only to locate data files that have missing names, but also to edit sectors on the disk, display disk formatting information, control screen displays, print files directly, reorder disk sectors for greater speed in accessing disk-based information, and perform other useful modifications. Oper-

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ating systems are designed to take care of these sorts of things for you, but as in the case of a missing data file, there are times when it's to your advantage to get at the computer on this nuts-and-bolts level.

Bag of Tricks, a $39.95 package for Apple computers, is available from Quality Software, 21601 Marilla St., Chatsworth, CA 91311; (213) 709-1721. It includes a utility called Fixcat that automates the process of rebuilding a damaged disk catalog. Also in Bag of Tricks are Trax, which dumps and examines a raw track and displays internal formatting information; Zap, a sector editor that enables you to locate, compare, or print disk data; and Init, which will reformat tracks to preserve the contents of undamaged sectors.

File Fix—$89 from Digital Marketing, 2363 Boulevard Cr., Walnut Creek, CA 94595; (800) 826-2222—works on 8-bit computers including 8-inch Compupro and 5¼-inch CP/M systems such as Osborne, Kaypro, Xerox, Televideo, and others. In addition to recovering erased files and reconstructing disk directories, File Fix protects, deletes, and renames files, offers password security for data files, copies and verifies files, and can even create a multiuser link to a CP/M file.

The Norton Utilities for the IBM Personal Computer is a comprehensive package available for $80 from Peter Norton, 2210 Wilshire Blvd., Santa Monica, CA 90403; (213) 399-3948. Its Unerase program locates data files whose names have been lost or erased, and its Filefix utility will recover whatever can be salvaged from a bad or damaged disk. The package also includes programs that let you explore actual disk contents, control "hidden" files, reorder sector format for greater speed, control screen displays, and print files directly.

Other data-recovery utilities may offer features more suited to your needs; the three we've described here are examples, not necessarily recommendations. The point is that no matter how careful you are, sooner or later you're going to experience problems with lost data, and you should know that you have options other than cursing or gnashing your teeth. —Elizabeth Cusick

Some Reminders

You've probably seen these guidelines before, but they will bear rereading. Remember that the best way to recover lost data is not to lose it in the first place.

- Treat your disks as the fragile items they are. Use felt-tipped pens, never ballpoint, to write on disk labels. Keep your fingers and all foreign material away from the unprotected areas of the disks. Keep dust, cigarette smoke and ashes, and pencil sharpeners and their graphite dust away from your disks and disk drives.
- Remember that disks are magnetic media. Because they can be erased by magnets, watch out for note-holding magnets and the strips on credit cards. Even the magnetic fields set up by floor polishers can damage data if the disks are stored too near the floor when the cleaning crew comes by.
- Store your disks carefully. Keep your backup disks somewhere away from your working disks so you're less likely to lose both. Don't leave disks lying around where things could be piled on top of them.
- Use the same drive for your source drive whenever you copy files or disks. Code your disk labels by color, using something like red for backups and other colors for working disks.
- Minimize disk failure by keeping your disk-drive heads clean. A head-cleaning kit costs between $25 and $30, lasts for a number of cleanings, and is well worth the price.
- Save an unreadable disk by copying the individual files one at a time onto a good disk. It doesn't always work, but if you haven't a backup, it's worth a try.
- Use write-enable tabs (the small silver or black opaque stickers that come with each box of disks) to prevent an accidental overwrite to the disk.
- Remember how much you have to lose when you are terribly pressed for time. Save as you edit, back up your files, and print out your data after editing.

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by Ron White and
Stevanne Ruth Lehrman

Time is of the essence in all phases of computing, but nowhere is this more true than in telecommunications. Time is the enemy when you're using your phone to communicate with one of the big electronic information services, because you're spending at least a dime for every minute you're connected. If you're receiving the latest market report long distance, you can almost see the meter clicking away as each character is displayed on the screen. Even if you're making a local call to a free electronic bulletin-board system, you're likely to be working under a 15- or 20-minute limit so that others will have a chance to call in.

In the consequent frantic effort to get as much communicating done as quickly as possible, the accomplices of time are fumbling fingers, forgotten passwords, and desperate searches through the instruction manual. Your only real ally is a good telecommunications program, one that can remember all the commands you forget, automatically enter passwords without typos, and help you meet the technical requirements of data bits, stop bits, timing, and the like. Ideally, an effective communications program is so easy to use that the software itself is unobtrusive; you should feel like you're sitting at the keyboard of the computer you've accessed.

But at the same time that a communications program has to be easy to use, it must be both a perfectionist and a memory master. The software should be able to verify that the information you receive is what was actually transmitted. A few garbled characters in a text file might not be disastrous, but a transmission error that substitutes a 9 for a 0 in a financial report could be costly. And all that information is virtually useless unless you have a way to save it on disk for later reference.

In the following reviews we'll look at three of today's most popular communications programs: Smartcom II, PC-Talk III, and Crosstalk XVI. Each covers the basic requirements we've just described. But while all three aim for the same goal—making communications over a phone line with another computer as flawless, easy, and quick as possible—each has its own personality. This "feel" of the software is what you will identify with or find alien, and as such it may finally be as important as any objective comparisons.

Smartcom II

In many ways, Smartcom II is a product that lives up to its name. When it comes to handling the various functions involved in communications, the program gives your computer a degree of competence that at times seems to verge on intelligence.

But as is often the case with technically sophisticated programs, the beginner could have difficulty with Smartcom II. Despite features included ostensibly to enhance ease of use—such as menu-based commands and handy macro capabilities—the program concentrates on machine-to-machine communications and slights communications with the human sitting at the keyboard. If that person is relatively new to computing, frustration could result.

Take the Smartcom documentation, for example. The impressive-looking manual is attractively printed, helpfully illustrated, and well organized. But when you start reading, you run into a technical tone that is far from friendly. This is not to say that there's anything inaccurate or, heaven knows, incomplete about the manual. Most of the features and operations of Smartcom are explained at least twice and supported with step-by-step examples. But in an age when users are demanding and, in many cases, receiving something beyond bald presentations of technical details, Smartcom's documentation comes up short. It does little to make the program's operation easy to grasp, even less to reassure a beginner.

Much the same may be said about the program itself. It is thoroughly workmanlike and will handle virtually any communications configuration you might need—but you could find it hard to work with.

AT A GLANCE

Name: Smartcom II

Manufacturer
Hayes Microcomputer Products Inc.
5923 Peachtree Industrial Blvd.
Norcross, GA 30092
(404) 449-8791

Price
$149

Format
One 5¼-inch, or two 8-inch floppy disks

Computers
IBM Personal Computer and compatibles, DEC Rainbow, Xerox 820-II, Kaypro II; requires 96K bytes of RAM

Documentation
226-page loose-leaf manual

Name: PC-Talk III

Manufacturer
The Headlands Press
POB 862
Tiburon, CA 94920
(415) 435-9775

Price
$35 donation requested

Format
Two 5¼-inch floppy disks, one with both interpreted and compiled BASIC code (compiled version requires 128K bytes of RAM) and one with documentation

Computers
IBM Personal Computer and compatibles

Documentation
70 pages on disk to be printed by user

Name: Crosstalk XVI

Manufacturer
Microstuf
Suite 140, 1845 The Exchange
Atlanta, GA 30339
(404) 952-0267

Price
$195

Format
One 5¼-inch floppy disk

Computers
IBM Personal Computer and compatibles, Eagle 1600, Hewlett-Packard 150, Seequa, Texas Instruments Professional, Toshiba T300, and Wang PC (all require 96K bytes RAM); another version, called simply Crosstalk, is available for most 8-bit CP/M systems with 64K bytes of RAM

Documentation
192-page loose-leaf manual

Illustration by Laura Smith

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Covering the Bases

Smartcom offers just about every feature the home user could want. It will transmit at 110 to 9600 baud using a variety of settings, time delays, and other accommodating parameters. It will automatically dial the phone (if your modem permits) and give you a running account of whether your modem is waiting, dialing, or resetting.

Unlike programs that allow you no option, Smartcom lets you capture incoming files directly on disk or in an internal buffer. You can set the program to pause and await your command each time the screen becomes full. With the arrow keys you can scroll through the information stored in the buffer even after it has rolled off the top of the screen, a handy feature not offered by many other programs.

Incoming information may also be stored on disk, but only as it's being received; the contents of the display buffer can't be transferred to disk (a surprising limitation, given the fact that at least several other communications packages allow this). If, however, you suddenly become aware that the information coming in should be on disk, you can use one of the function keys to begin recording to an all-purpose file called Temp.

Smartcom naturally includes capabilities for erasing, renaming, and displaying files, but it also goes beyond many other programs in offering a bare-bones word processor for creating files. It's nothing you'd want to write home about, but you'll appreciate it when you want to reply to a message, for it lets you sign off, create a file, and then log back on to send it rather than having to come up with the message while you're paying for connect time.

For sending files, Smartcom uses its own verification protocol, which must also be used by the computer you are swapping files with. The communications program MITE, from Mycroft Labs, also supports this protocol. Similar to verification protocols under other names, Smartcom's protocol transmits a block of data and then compares a few facts with the remote computer to see if everything survived the hazards of phone-line noise. If the check reveals something suspicious, that block of information is retransmitted.

Menu Mania

In short, Smartcom covers all the basic requirements of a communication program. Whether you like Smartcom depends largely on how much you like menus, which is the only way to handle the program's features. And it may also depend on how you feel about the erratic way that Smartcom uses menus.

When you boot Smartcom, the first work screen you see is the top menu. From it you can select functions to begin communications or to edit or create a set of parameters for hooking up with a particular system. You also have the choices of working with a file, changing some of the system's settings, displaying the disk directory, or ending the program. The menu options that aren't available until you've connected with another computer—send file and receive file—are marked with asterisks instead of menu numbers.

Because the program assumes you want to begin communications, that menu option is displayed in boldface and its number is automatically in the selected position. If the assumption is correct, you go on to the next menu, which lists the communications sets (groups of parameters such as baud rate, parity, stop bits, etc.) for various systems you might want to call. The program includes 10 handy predefined sets for connecting to The Source, Compuserve, Knowledge Index, the manufacturer's own Smartcom bulletin board, and others.

By using the blank spaces in the communications-sets menu or by erasing or modifying some of the predefined sets, you can define as

Ron White, owner of a San Antonio marketing and communications service called Word/Image, is currently preparing a guide to IBM-compatible computers for Brady Press. Stevanne Ruth Lehrman is founder and vice president of Product Evaluation for Analytic Resources in Newton, Massachusetts, an information-analysis service specializing in software documentation and evaluation of preproduction software.

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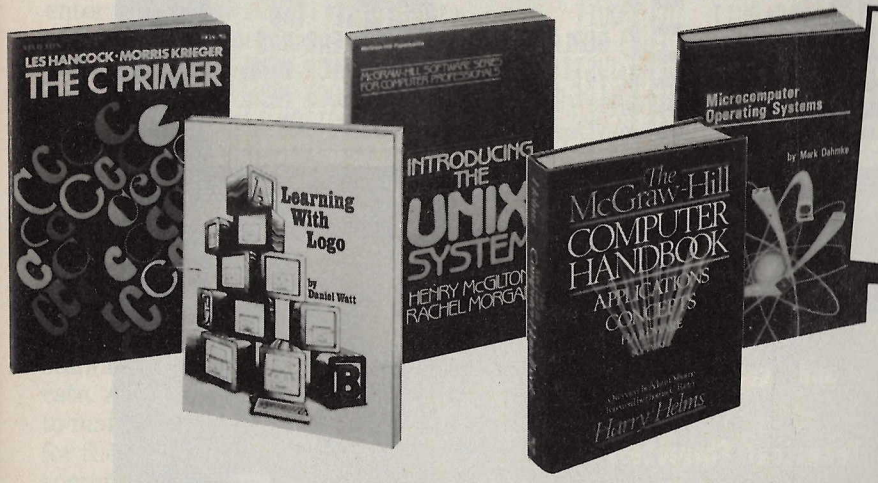

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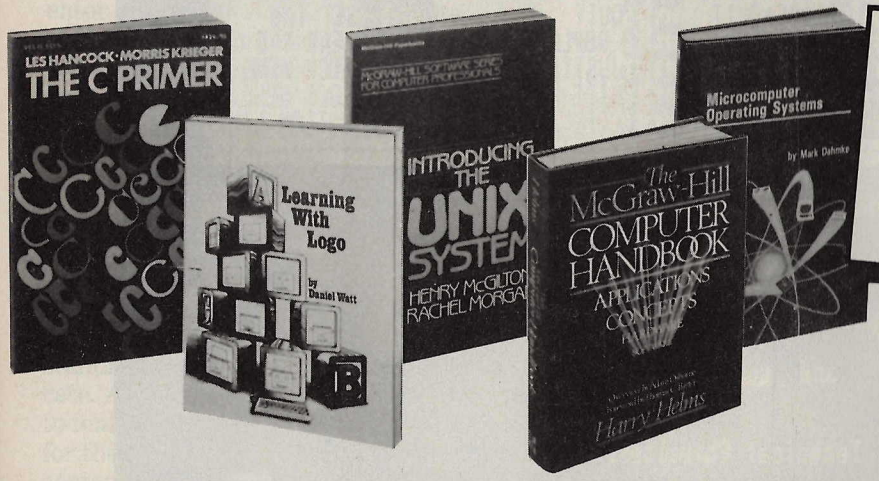

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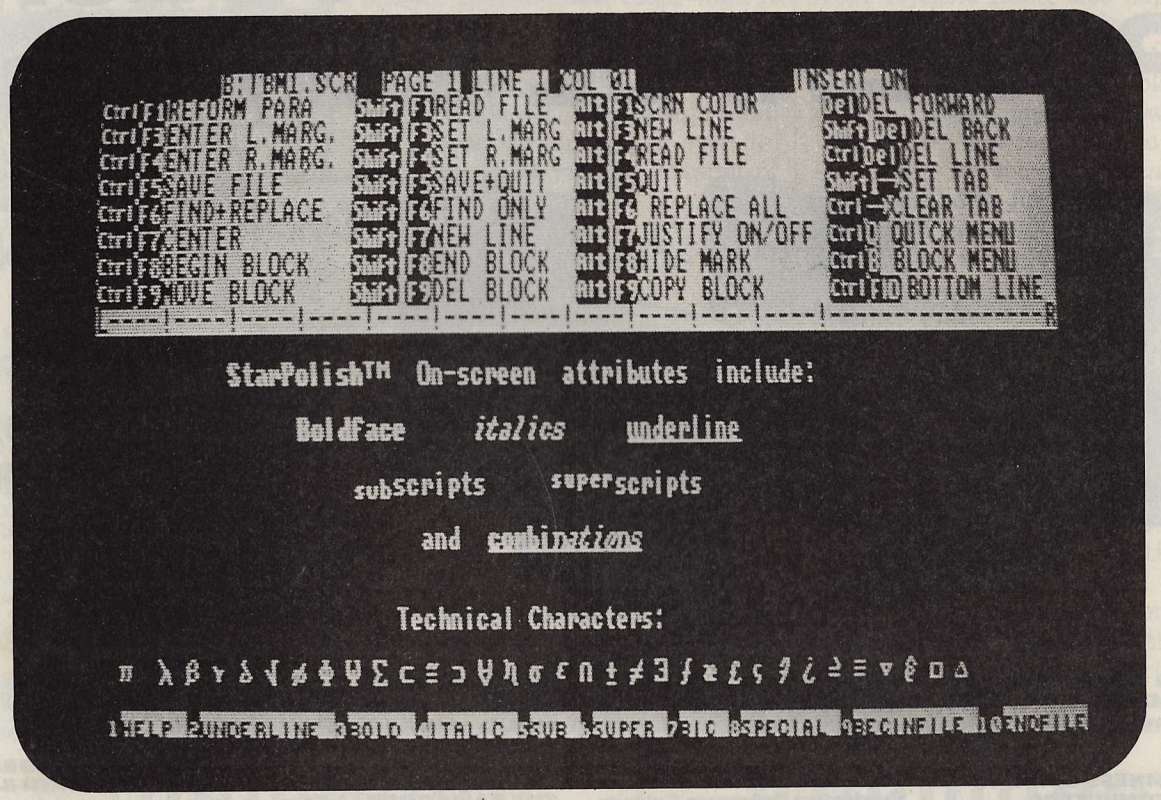

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many as 25 sets especially to suit your own needs. This customization option is presented in the top menu, but the actual configuration screens you use to accomplish such redefinition are once again a potential stumbling block for beginners. For instance, they suggest that you must enter decimal or ASCII equivalents of Control-key combinations when in fact the actual key-label designations will suffice—though neither the screens themselves nor the documentation tell you this.

Speaking of menus brings up one of our biggest beefs about Smartcom. The program's creators obviously know a lot about how machines communicate, but Smartcom's use of screens shows little understanding of how people communicate. Although menus are intended to make operating software simpler for the uninitiated, Smartcom's presentation of menus is so confusing that it tends to defeat that intent.

Negotiating the program's menus can be frustrating. One reason is that often as many as four menus are on the screen at a time, each with a different place to fill in your selection. Your eye cannot become accustomed to going to a particular place on the screen, as it does with a command line or menus whose configurations more or less match each other.

Once you've figured out where the cursor is and which menu you're supposed to be selecting from, you make a choice either by moving the boldfaced indicator to the desired item with the left- and right-arrow keys and then pressing Enter or by keying in the menu label directly. But look at this menu:

P(arameters, M(acros, R(eports,
C(opy, S(elect Set: P

It took some fumbling before it became clear that Smartcom's strange use of parentheses was supposed to tell you to press P if you wanted the selection called Parameters. Why not the more commonly used, and more obvious, (P)arameters, [P]arameters, or <P>arameters? The confusion is greater because menus are not labeled consistently. Luckily, only a few menus use the P(arenthesis method. Others use the alphabet to label choices, and still others require you to enter a number instead of a letter. This lack of consistency is maddening.

Easy Macros

But just when you're ready to roundly condemn Smartcom for such frustrating inconsistencies, you come across a feature so well implemented that you relent. The program's macros—handy aids for automating routine commands—are a prime example. You can create a macro for logging onto a system or automatically checking your electronic mail, for instance. By filling in the information requested on the macro configuration screen, you tell Smartcom what prompts to look for from a particular system and what responses to give. Moreover, the section of Smartcom's manual on configuring a macro is distinctly better than other parts of the book.

As with communications sets, Smartcom includes preconfigured macros for some of the popular electronic bulletin boards. For example, the program comes with macros that will take you directly to certain sections of Compuserve. These are helpful not only for everyday use, but more so as examples to be studied for configuring your own macros.

But a serious blemish on the potentially helpful feature lies in the way macros are invoked. You're supposed to press F5 followed by the desired letter label on the macro menu. But you'd better have a good memory or a printout of the macro menu, for you can't display it without going back to the top menu and stepping through about four or five menu operations. The time the macro saves can easily be wasted in invoking it.

Another example of the program's skimping on user convenience is that while Smartcom makes use of only five unshifted function keys, it provides no means (unlike Crosstalk and PC-Talk) whereby you can program the remaining keys. It would be so much simpler to put a frequently used sequence of menu commands all on one function key and just hit it rather than wading through menu after menu.

Smartcom will give you on-screen help at just about any point in the process of going through a menu or setting up a configuration or macro set. The program checks to see where you are and displays the help screen that pertains to that operation. The help screens, however, are more concerned with the mechanics of making a selection than the possible implications of the choices you can make. Too often there was no on-screen information on how to escape from a menu. We cannot fault Hayes's telephone help line, however. The person we talked to answered all questions promptly and thoroughly.

In the final analysis, then, Smartcom II is something of a Jekyll and Hyde. Nearly every well-designed feature is offset by an awkward minor flaw. Help screens are context sensitive, but their information is limited. Macros are easy to set up but difficult to execute. Menus are generally laid out in such a way that the ease of use they promise is minimized. In its Hyde phase, the program is too preoccupied with distracting technical detail, but the Jekyll side features enough powerful, well-designed features to earn Smartcom its good reputation. If the program were as concerned with effectively communicating with its user as it is with efficiently communicating with another computer, there would be little to criticize.

PC-Talk III

If you're a home computer owner interested in getting started with telecommunications, the preceding review of the high-powered Smartcom II may have done little to encourage you. Smartcom is a relatively expensive, quite sophisticated communications package offering features that go far beyond the basics. But you're not even in a posi-

tion to recognize what these advanced features can do for you—what you need is an inexpensive communications package that's easy to use and gives you the fundamental features you need to get started. It may well be that what you need is PC-Talk III.

Part of PC-Talk's strength is its adaptability: it can accommodate anything your modem will. You can transmit or receive data at speeds from 96 to 9600 baud. Dialing can be Touch-Tone or pulse, manual or automatic, with auto-dial capabilities. (Whenever we focus on a particular feature, the underlying assumption is that your modem can perform the task. PC-Talk, good as it is, can't run a 300-baud modem at 1200 baud.) Perhaps the program's only truly serious limitation is that it cannot perform terminal emulation, which makes it unsuitable for business telecommunications. But the home user interested in connecting with information utilities, bulletin boards, and other microcomputers won't miss this capability.

From the Top

PC-Talk's dialing directory is the starting point for all communications. Sixty names and telephone numbers with associated communications parameters can be displayed by typing Alt-D. Adding or revising a listing is simple and logical: following the prompts on the directory screen, you type in name and phone number in the appropriate places. The program supplies default settings for baud rate and parity—you can leave these as they stand, change a particular setting, or provide new default settings for all entries. Communications parameters and echo, message, stripping, and pacing instructions can be set when the listing is first created or changed when necessary.

Calls are placed through the dialing directory. PC-Talk will automatically dial a particular directory listing, using either Touch Tones or pulses as needed, or set the communications parameters for a number you dial manually. For those with modems capable of repeat-dialing a number, PC-Talk will trigger redialing of the last phone number called. Also, the program can route calls through long-distance carriers such as Sprint and MCI, a boon to anyone who routinely dials 20-number sequences to reach a remote host computer.

Like more expensive programs, PC-Talk can store strings of up to 126 characters in its function-key directory. You can use this capability to accommodate host systems that require identification numbers or specific log-on sequences as well as to initiate transmission of a particular file once you're connected. Programming the function keys is not much more complicated than entering names and telephone numbers in the dialing directory.

As far as the actual transmission of data goes, you'll find that PC-Talk is very flexible. The program requires no special protocol from the remote computer—it can adapt itself to the host's requirements. Files can be transmitted one line at a time, with a time delay between lines, or as triggered by a prompt. If you are using Tymnet or Telenet to communicate with The Source or Compuserve, you'll find the pacing option invaluable. When those utilities are being used heavily, they cannot accept data as fast as your computer can transmit it.

PC-Talk displays on your monitor the text of the file being transmitted. The prompt line indicates the name of the file being sent and the approximate remaining transmission time. The transmission routine may be terminated manually at any point, or it will terminate automatically at the end of the file. Both standard ASCII files and binary files can be transmitted.

Verification

The accuracy of transmitted data is always crucial in telecommunications. PC-Talk uses the common XMODEM protocol, which sends error-checking signals to verify the accuracy of a transmission. If these signals indicate a potential error, the data is retransmitted.

Line errors during telecommunications are inevitable. Voice telephone lines were never designed to handle error-intolerant data. Surges and static that are scarcely noticeable when you're talking can play havoc with data transmission. XMODEM will handle many of the problems caused by temporary interference on the line. If the line signal is not clean enough for accurate transmission, file transfer will automatically terminate.

Absurd as it now seems, some early communications programs ignored the fact that microcomputers have disk drives. You could talk with the remote computer but could not save a record of the conversation. PC-Talk was one of the first programs able to capture data on a PC-DOS-format disk.

PC-Talk saves incoming files on a disk just as conveniently as more expensive communications programs. If you designate an existing file name, the new data will be appended to the end of that file rather than overwritten on the original. You can toggle the save on and off several times during a single session; PC-Talk automatically adds to the previously designated file unless instructed to begin another one.

To facilitate naming the new file and selecting existing files, PC-Talk will display a list of the files on any drive. Any of these files can be reviewed, renamed, or deleted without leaving the program. However, integral file-editing functions, a helpful feature offered by some of the most complete communications packages, are not included in PC-Talk III.

In the same way that saving communications on disk can be switched on or off at will, PC-Talk lets you toggle printing on or off at any time without disrupting the process. If you're using a slow printer and a 1200-baud modem, though, printing incoming data as it is received may hamper the efficiency of the transmission. When you need a printed record of your communications, it is faster to save everything on disk and

print it out at a later time.

Ease of Use

Very few communications packages (whatever the price) can outdo PC-Talk III when it comes to offering so many capabilities in such an easy-to-use format. Whether on or off line, functions are invoked by typing Alt with a single letter. A prompt line at the bottom of the display tells you where you are in the program and what functions are available. Pressing Home displays a list of all commands. At every point where you need to make a choice, PC-Talk gives you a list of options. Where accuracy is crucial, the program asks you to confirm your instructions.

PC-Talk's programmable directories make it easy for you to save the lengthy keystroke sequences required for complex transactions. A phone number with attendant communications parameters needs to be entered only once. After that, you simply type a number at the dial prompt or use a two-key combination. If you have forgotten what you assigned to a particular listing, you can call up a directory in a flash.

It's a tribute to PC-Talk's designers that the program's documentation is nice to have but hardly needed. Given the program's on-screen Help features and clear prompts, most functions are self-explanatory. But the user's guide is available for those who want a bit more detail or like the reassurance of print on paper. And unlike many manuals, this one is 70 pages of plain English.

Where to Find It

If PC-Talk III is making such a name for itself, why haven't you seen it on lists of best-selling software? Why have you never seen it among the dazzling arrays of software packages on the shelves of computer stores? The answer is simple: you don't buy it from your local computer store. Andrew Fluegelman, author of PC-Talk III, is one of the unsung heroes of the microcomputer revolution. Through his Freeware system, PC-Talk has been widely distributed through users groups, bulletin boards, and informal software exchanges.

If your local users group does not have a library of public-domain software, you can get a copy of PC-Talk by sending $35 directly to Headlands Press in Tiburon, California. Those who obtain PC-Talk through a software exchange or from a library of public-domain software are encouraged to send $35 to Headlands if they decide to use the program on a regular basis.

In many ways, this Freeware system is the ultimate test of a program's quality. No marketing hype creates artificial demand for a barely adequate program; no salesmen push the product to earn bonuses. Thus PC-Talk had to deliver to survive, and indeed it has flourished—growing from the minimal PC-Talk I into the responsive, easy-to-use, flexible version III. In an informal poll of the Boston Computer Society's IBM PC Users' Group, PC-Talk III was a strong contender for the title of Most Popular Communications Package, a status it has earned entirely on its own merits.

Crosstalk XVI

A message that recently appeared on an electronic bulletin board highlights one of the drawbacks of menu-driven software. In its entirety, the message read, "Software that uses menus is like a bicycle with training wheels that can't be removed."

The writer was getting at what some consider the built-in obsolescence of software menus. For someone just getting started with a program, menus are unquestionably quite helpful. But once that new user gets some experience, going through a series of menus can get to be a drag. This is why many contend that the extra effort involved in learning a command-driven program pays off in faster operation and the opportunity to use functions too complex to frame in a menu.

The electronic message quoted above was signed by Jeff Garbers, one of the original authors of Microstuf's Crosstalk XVI, a communications program that shows evidence of having been created by a programmer who is compelled to write electronic graffiti badmouthing menus.

Many contend that the extra effort involved in learning a command-driven program pays off in faster operation and more powerful functions.

Not that Crosstalk totally banishes menus—to use Garbers' analogy, Crosstalk's combination menu/prompt/command system is like retractable training wheels. Beginners can use Crosstalk's help screens, prompts, and limited menus until they are ready to solo with commands only. But even then the complete selection of prompts and the easily accessed collection of help screens are available—they're like training wheels that can be instantly reinstalled anytime you lose your way and start to get wobbly.

Basic Credentials

Crosstalk will do just about anything you could ask of a communications program for the IBM PC and compatible computers. It supports transmissions at 110 to 9600 baud and, unlike programs designed primarily for communications between microcomputers, comes with options already set up to make your computer emulate Televideo, IBM 3401, ADDS Viewpoint, DEC, and Texas Instruments terminals.

One Crosstalk feature that is menu based is its dialing directory. The directory is automatically displayed at the start of a session, and you select the number next to the entry you want to call. If your modem permits, Crosstalk will dial

the number for you, wait for as many seconds as you wish for the other line to answer, and wait to redial as often as you've dictated.

Crosstalk can answer an incoming call, display a greeting and, if desired, demand a password that will give the incoming caller different levels of access to the program's operations. If incoming callers are also using Crosstalk and have the proper access, they can get a directory of your disk drives, read any file, or send you their own files without your even being in the same room with your computer.

Crosstalk—unlike Smartcom II but like PC-Talk—can handle both ASCII and binary file transmission. The program uses either or both of two methods to verify that the received file hasn't been garbled by phone-line interference. Crosstalk's own verification procedure can be used only if the computer you're tied to is running Crosstalk or Transporter, another Microstuf communications program. The other verification procedure is the XMODEM protocol, also used by PC-Talk III.

Crosstalk does not offer the sort of file-editing capabilities found in programs like Smartcom II. The only way to create a file is to leave the program and engage a word processor. But you can erase files from within the program, and file directories can include the file sizes or—here's a helpful touch—the amount of time it would take to transmit a given file at your current baud rate.

Crosstalk can capture incoming files in either your computer's internal memory (RAM) or directly on disk. Capturing data on disk is safer if there's the possibility of a power outage, and it's usually the better choice if your computer has too little memory to hold the entire incoming file. You can add new data to an already existing file as it is received.

Capturing transmitted data in RAM has its advantages, though. Although you cannot scroll through text that has already disappeared off the top of the screen (as you can with Smartcom), Crosstalk lets you search your RAM for a key phrase. Also, while Smartcom will capture data on disk files only as it's being displayed, Crosstalk can transfer its memory buffer to disk at any time.

Crosstalk preconfigures your computer's function keys for several of its functions, but unlike Smartcom, the program allows you to change these configurations and save your new ones as macros that Microstuf calls "script" or "command" files. Because different script files will automatically configure the same function keys to accommodate the requirements of whatever system you're calling, you don't have to remember which function key contains what log-on configuration—the script file supplies the appropriate sequence.

Making It Easy

Given a basic knowledge of telecommunications, you can use many of Crosstalk's features without touching the program's printed documentation. All you need to know is that you have to use a certain baud rate and that something called parity has to be even, odd, or none. You don't really need to know what they mean; you just need to know that you're going to set them to match those of the computer you're trying to reach. The current system settings are always displayed on a status screen next to self-explanatory labels.

Another feature that makes a large part of the Crosstalk manual merely back-up hard copy is that nearly all the information printed in the manual is more readily available from the extensive collection of help screens. Entering Help by itself will produce a list of all the available commands, and HE followed by the name of a particular prompt or command will get you a message explaining that command and the effects of its different uses.

Crosstalk's status screen is the first working screen you'll see after beginning the program. Graphic borders from IBM's character set neatly divide the screen into logical groupings of the settings needed to cover virtually any configuration. You fill in labeled spaces for the name of the person or service you'll be calling, the phone number, the baud rate, parity setting, the serial port you want to use, and so forth. Several other blanks relate to specific Crosstalk capabilities, such as stripping control characters from incoming files and specifying conditions to be met before the program transmits the next line of a file. Whenever you boot Crosstalk, the bottom portion of this screen displays the directory of configurations available for both originating and answering a call.

Once you're connected to the remote system, the display switches to the terminal screen that shows your communications. The bottom line of this screen indicates whether incoming data is being stored in RAM or on disk, how much RAM is available, and how long you've been connected. Hitting the Escape key at any time puts you on the command line, where you can send a file or control other functions of the program. You can switch back and forth between the terminal screen and the status screen by pressing Home.

Mighty Macros

So far we've been talking about a solid communications package with some nice bells and whistles. But what really sets Crosstalk apart from similar programs are its script and command files.

These special files are created with Crosstalk's own high-level programming language, similar in principle to dBASE II's built-in programming language. When you create a script or command file, you are essentially writing a program to control the operation of the Crosstalk program itself. While developing a script or command file is not as simple as using Smartcom II's macro configuration screen, the resulting Crosstalk macro can include much more complex operations based on conditional statements.

Newuser is a preprogrammed script file that helps you get started on filling in the right settings for a particular remote computer by ask-

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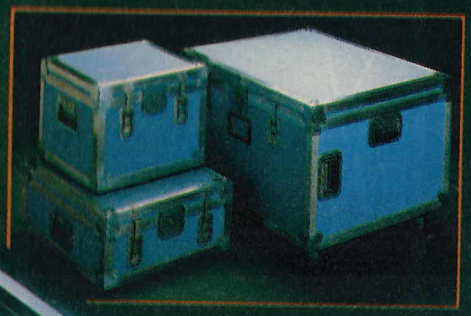

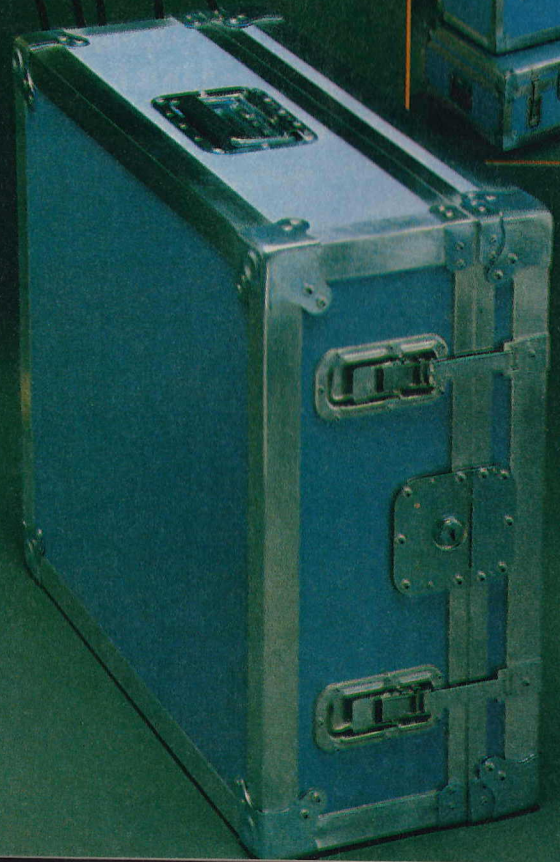

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ing you questions and prompting you with the different possible answers. It transfers your answer to the status screen and, after all the questions have been answered, writes another script file to save the configuration you have created.

Crosstalk's script and command files differ only in that script files set up communications configurations and command files control operations after communications have been established. Both are written with commands equivalent to GOTO, INPUT, IF, and others that BASIC programmers will recognize. If you aren't a programmer, don't be put off—Crosstalk has only about 15 commands, and the concepts behind them are given an adequate (if not complete) explanation in the manual. Script files may be created either in response to Crosstalk's prompts or with any word processor capable of saving files in an ASCII format; command files can be created only with a word processor.

Although command and script files may need to go through testing, debugging, and revision, it's possible in a few minutes to write a simple 12- to 15-line command file that will automatically log you on to a particular computer system, providing your name, ID number, password, or whatever other information the system requires.

Command files can be quite complex. For example, we created a command file to log on to Compuserve, skip over its introductory menu, go straight to the IBM Special Interest Group (SIG) section, and present a menu that allows for reading any specifically addressed messages, scanning new messages in the SIG's compatibles or general-interest sections, taking a side trip to Compuserve's Author's SIG, or logging off. With this sort of command file, all you have to do at the A: prompt is type XTALK COMPU. From there, the command file dials Compuserve, logs you on, and guides you to the section you've programmed it to. The whole operation rarely takes more than two minutes.

Considering the great potential of Crosstalk's command language and the fact that it's the most complex feature of the program, one wonders why the Crosstalk manual doesn't give more examples and details about the language. But in a way this is characteristic of the manual. The latest version is better geared to the average user than Smartcom's technically oriented manual, but it lacks detail. While the guide does include specific instructions for wiring a cable and setting the DIP switches for several popular makes of modems and computers, it is suprisingly uninformative about many of the program's best features, such as the macro commands.

Few Faults

Crosstalk's few outright faults and even its lack of thorough help in the creation of command files are hardly serious flaws for a program that offers so much. The program itself is more than functional—it's fun. It works so smoothly and simply that you find yourself wondering why all software doesn't do the same. "Friendly" is a word that's been applied so indiscriminately to any software someone's trying to sell that calling Crosstalk friendly just doesn't convey the way it unobtrusively uses your own intuitions to guide you through its operations.

So in the final comparison, a program like Smartcom II would be just the ticket for a communications engineer or someone who wants access to the technical details of a communications program. PC-Talk III is at the opposite extreme—it's especially suited to the beginner who wants to get a basic start in home telecommunications without spending a hefty sum. But for the average to advanced user who wants full capabilities in an easy-to-use format, Crosstalk XVI's powerful features, framed as they are in its consistent, intuitive design, make it an excellent choice. □

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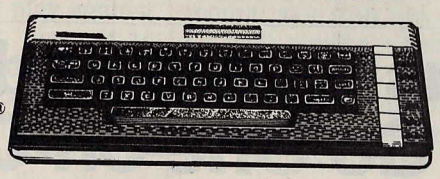

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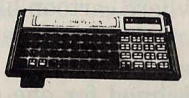

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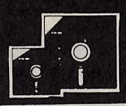

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by Joseph J. Elia Jr.

Strange business, this game of basketball. An American game started at a YMCA in Springfield, Massachusetts, with a soccer ball and a couple of peach baskets. Much faster than baseball. Doesn't take acres of playing fields either, and you can play inside during the winter. Terrific for city kids. I got my first shot by lugging another kid's ball up into the old three-story chicken coop that served as the neighborhood backboard. I just stuck my head out a window and dropped the ball—I missed, of course. You always miss your first shot.

Now comes Electronic Arts' interpretation of the game, and not surprisingly it's a delicious combination of sports and fantasy that lets you dribble more confidently than you ever thought possible, slam-dunk with backboard-shattering effect, and, perhaps best of all, allows you to pretend that you're either Julius Erving or Larry Bird. And for those of you who don't recognize those names, Erving (also known as Dr. J. or the Doctor) and Bird are two of the hottest names on the NBA circuit today.

Julius Erving and Larry Bird Go One-on-One presents an electronic basketball court where cartoon-like representations of the real stars romp about under the direction of your joystick. Designed for one or two players, the game gives you your choice of basketball personalities as well as fairly extensive control over the conditions of play.

The electronic versions of these nimble-footed NBA stars are more than just namesakes. Incorporating some of the characteristics that make these players great, the on-screen personas are close to the real thing. For example, the on-screen Dr. J. is designed to perform the same kind of magic leaps and fancy handwork that drive the Doctor's fans wild. And Bird's on-screen counterpart is good on the rebounds, can shoot from the outside, and plays a strong defense similar to the way the Boston Celtics player operates on the court.

Both Erving and Bird worked with program designer Eric Hammond to help him capture the essence of their style. Each articulated his particular strengths as an offensive and defensive player while revealing favorite strategies and tried-and-true standbys. Wherever possible, Hammond incorporated the trademarks of each player into his game. So let's grab our sneakers and head off to the court for a closer look at this electronic hoopla.

Setting Up

As you look at the video screen you're at mid-court with the net in front of you—not to one side of the screen as in older video versions of basketball. Like any one-on-one game, there's only one basket to shoot at. At the beginning of each session, a menu offers you a series of alternatives for play. For instance, you can choose from four levels of difficulty, ranging from the beginner's level, called parks and recreation, through the more difficult varsity and college levels, to One-on-One's toughest test, pro.

You then decide whose sneakers you want to step into, Bird's or the

Joseph J. Elia Jr. is the manager of editorial operations at the *New England Journal of Medicine.*

Doctor's, and the computer plays the other guy. Or you can play against another person. Next, you get to specify when to call the game over. Would you like to end at 21 points? Play timed quarters? How long would you like the quarters to run, two minutes? four? Finally, will it be winner's outs or loser's? In "winner's outs," when you score a basket, you get the ball back immediately for another try; in "loser's outs," after you score you give the ball to the other guy and let him have a chance.

Traversing the Court

As play begins, you'll notice that the action flows a bit more slowly than "real life" speed, but not quite at slow motion—more like about three-quarter speed. The slight slowing down seems to put you in command of the figure on the screen.

You'll also notice that your opponent is closely guarding you and has likely stolen the ball before you could mount your first run at the basket. Oh well, you'll get better with practice, and at least dribbling is automatic (one less skill to work on), and motion around the court comes from the joystick, so the "feel" of the game is very smooth. To turn your player around so he can dribble with his back to his opponent, for instance, you give the firing button a quick click. If you hold the button down, the player starts a shot sequence, releasing the ball when you release the button.

It's impossible to miss the hoop once the shot sequence has started. That doesn't mean that all your shots will go in—some will bounce off the rim and set up a contest for the rebound—but most will drop for you. The only sure shots seem to be the close-in jumpers and lay-ups, although even these can be deflected by a tenacious defense.

If you drive to the basket and time things right, you can even slam dunk. A ferocious jam will shatter the backboard, prompting a figure with a broom to come out onto the court, scold you, and sweep up the debris. Fouls are called; every so often a referee steps into view and calls you or your opponent for hacking, reaching in, or traveling. Other authentic details include 3-point shots, a 24-second shot clock, and instant replays from time to time. The replays, by the way, make you look terrific.

All this activity tires out real players, so author Hammond has incorporated a fatigue factor. Thin lines appear along the bottom of the screen, and as the lines get longer, the player's performance starts to suffer, especially on rebounding. A tired player, for example, will jump only half as high as a fresh one, and this, of course, can have a big effect on the play.

Fatigue is not the only intangible

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at work. The scoring seems to show all the ebbs and flows of real-life contests, with one player making a convincing hot shooting streak while the other can't even hit a foul shot.

View from the Locker Room

The real fun of One-on-One comes when you play against another person. After all, the computer can't succumb to any psyching out you might want to try, and taunting a keyboard after a particularly good shot just doesn't gratify the ego. With two players, the ideal setup is for each player to have a joystick. If you have only one joystick, your opponent will have to control play from the keyboard—and there's not much fun in that.

My main opponent has been my 6-year-old son with no basketball experience and no chicken-coop backboard in his neighborhood, yet he regularly beats me in long games by a basket or two.

Don't mistake One-on-One for a computerized basketball clinic. It's not that at all. What Hammond has created, with the help of two of the best players in the game, is a playable fantasy that's part sport, part whimsy, and all fun. □

At a Glance

Name: Julius Erving and Larry Bird Go One-on-One

Type
Action game

Manufacturer
Electronic Arts
2755 Campus Dr.
San Mateo, CA 94403
(415) 571-7171

Price
$40

Format
5¼-inch floppy disk

Computer
Apple II and IIe, Atari 400, 800, and 1200XL, Commodore 64, and IBM Personal Computer, XT, and PCjr

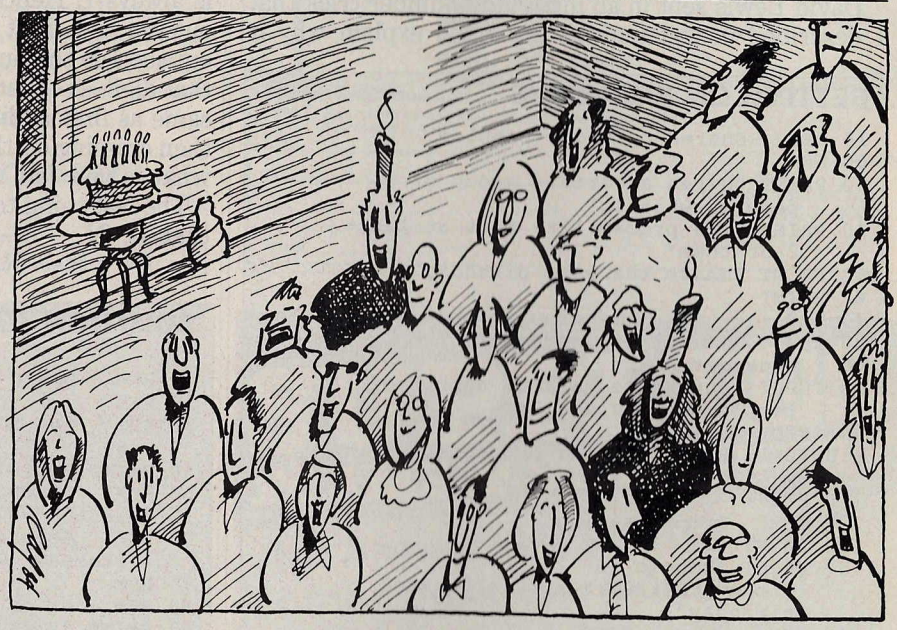
Documentation
13-page booklet

Audience
Basketball fans and joystick athletes

Betting on Birthdays

How likely is it that two people in a small group share the same birthday?

by Michael W. Ecker



In a room are gathered 40 people who are total strangers to each other. They have been chosen randomly. How likely is it that at least two of them have the same birthday? Would you be willing to bet that no two people in this group share the same birthday?

If you—like most people—think it's very unlikely that two people share a birthday, you'll be surprised to learn that with 40 people randomly chosen, the probability is about 90 percent that two individuals will have the same birthday! In other words, not only is it much more likely than you may have realized, but you could even afford to give odds rather than take them. In fact, in my less sporting days, I got quite a few people to bet against me at a party where about 45 people were present. I got nervous as I went through the calendar month by month, but by the time we reached September, two people gave the same date, and I happily collected my bets. Those of you who get a real thrill from uncertainty might enjoy knowing that a group of 23 people provides odds as close to 50:50 as possible.

Let's see how this comes about. First, you have to throw away your preconceived ideas about probability. Second, you have to realize that this problem is best solved indirectly. That is, we first find the probability that no two of m people have the same birthday. Then we subtract that answer from 1. For instance, if we find the probability that no two people out of 40 have the same birthday is, say, .1, then the probability must be .9 that two people do have a common birthday.

Here, then, is how we calculate the probability that no two of m people have the same birthday. The first person asked may have any birthday at all. The second person has a probability of 364/365 (because most years have 365 days) of not having the same birthday. The third person has a probability of 363/365 of having a birthday different from the first two. And so on. Because we are dealing with assumedly independent events, the probability of all these happening is just the product of the individual probabilities for the m people:

$$(365/365) \times (364/365) \times (363/365) \times \ldots \text{(and so on)} \ldots \times ((365 - m + 1)/365)$$

Remember, this calculation gives the probability that *no* two people have the same birthday. Hence, we have to calculate 1 minus that probability for the probability that two do share a birthday. The BASIC program on page 190 will calculate this probability for as many values of m as you wish. You can play around with interesting variations.

Contributing editor Dr. Michael W. Ecker is Assistant Professor of Mathematics at Worthington Scranton Campus, Pennsylvania State University.

Illustration by Rich Goldberg

Gauss's Punishment Revisited

Last month I explained the shortcut that Gauss used for calculating the sum of an arithmetic series. (An arithmetic series is one in which the successive terms vary by a constant amount.)

As an exercise, I suggested that you write a BASIC program to total the first 1000 odd numbers the long way by simply adding each of the 1000 terms. Our answer is given in the listing below.

If Gauss were doing the problem manually, no doubt he'd use the shortcut of adding the first term and the last term, multiplying by the number of terms, and dividing by 2. Gauss would probably come up with the answer quicker than your personal computer can.

Last Month's Number Trick

David Lewis sent in an intriguing number trick that I described in last month's issue. I'll explain why it works, but first, here's the trick.

Any number of friends may play. The computer picks a random number R from 1 to 50, and each friend picks a number N from 51 to 99. The computer now gives him the number 99 − R to add to his own. Next, each friend crosses out the first digit of the sum, then adds that digit to the last number (the one with the digit missing). Last, each friend subtracts that answer from his original number. The result, surprisingly enough, is always the number the computer selected at the start, no matter what number each friend choses.

Here's the explanation: When the computer gives each friend the number 99 − R to add to his own, this gives a total of N + 99 − R. Since N is at least 51 and 99 − R is at least 49, the sum N + 99 − R is at least 100. In fact, it is a number in the lower 100s, so the first digit is always 1. Hence, with the next step being to cross out the first digit of the sum, you are always crossing out the 1 in the hundred's place for N + 99 − R. Next, that digit—1—is added to the sum. The net effect is the same as first adding 1—to produce N + 100 − R—and then crossing off the first digit. This makes it clear that what is now left is just N − R.

The last thing to do now is to subtract that answer—that is, N − R—from the original number, N. But N − (N − R) = R, so the result is just the original num-

BETTING ON BIRTHDAYS

```
10 REM   Shared birthday problem
20 REM
30 PRINT "Given a certain group of
     people, what is"
40 PRINT "the probability that at least
     2 of them"
50 PRINT "share the same birthday?"
60 PRINT
70 REM
80 REM   Get largest number of people to
     consider
90 INPUT "Enter the maximum number of
     people to consider ";M
100 REM
110 PB=1: REM   Initial probability
     multiplier
120 REM
130 REM   Print heading
140 PRINT
150 PRINT "People in
     group";TAB(20);"Prob. of shared
     birthday"
160 REM
170 REM   Calculate probabilities for
     groups of 1 to M
180 FOR G=1 TO M
190 P=(365-G+1)/365
200 PB=P*PB
210 REM
220 REM   Print results for each group
     size
230 PRINT TAB(7);G;TAB(27);1-PB
240 REM
250 NEXT G
260 END
```

GAUSS'S PUNISHMENT

```
10 REM   Sum of 1st 1000 odd numbers
20 REM
30 SUM=0
40 FOR J=1 TO 1000: REM   Count to 1000
50 ODD=2*J-1: REM   ODD is the Jth odd number
60 SUM=SUM+ODD
70 NEXT J
80 PRINT "Sum is ";SUM
90 END
```

SOLUTION TO THE NUMBER TRICK

```
10 REM   David Lewis' Number Trick
20 REM
30 REM   Get a random number from 1 to
     50
40 R=INT(RND(0)*50)+1
50 REM   IBM PC use "R=INT(RND*50)+1"
     instead
60 REM   Some TRS-80's use "R=RND(50)"
     instead
70 REM
80 REM   Print instructions
90 PRINT "Pick a number from 51 to 99"
100 PRINT "and write it down."
110 INPUT "Press <Enter> to
     continue";EN$
120 PRINT "Add ";99-R
130 INPUT "Press <Enter> to
     continue";EN$
140 PRINT "Cross out the leftmost
     digit."
150 INPUT "Press <Enter> to
     continue";EN$
160 PRINT "Add the digit you crossed
     out."
170 INPUT "Press <Enter> to
     continue";EN$
180 PRINT "Subtract the result from your
     original number."
190 INPUT "Press <Enter> to
     continue";EN$
200 PRINT
210 REM
220 REM   Reveal the number
230 PRINT "The number you ended up with
     is ";R
240 REM
250 END
```

ber R chosen by the computer, independent of the choice of any one friend's number, N. The program on page 190 illustrates how it works.

Bouncing Ball Solution

Last month I also gave the problem of a bouncing ball that is dropped from 100 feet and always bounces exactly $7/10$ as high as it did on the previous bounce. The ball therefore bounces 70 feet after the first impact, then 49 feet (.7 × 70) the next time, and so on. Keeping in mind that the ball both rises and falls each distance other than the initial 100 feet, how far does the ball travel in its up and down motion until it eventually stops? The program listing below provides a computer solution. □

Editor's Note: Next month look for an abbreviated version of Michael Ecker's column in *Popular Computing*. If you have puzzle suggestions or solutions, comments or questions, please send them to Dr. Michael W. Ecker, 123 Carol Dr., Clarks Summit, PA 18411. To receive an individual reply, please include a large, self-addressed, stamped envelope.

HOW FAR DOES THE BALL BOUNCE?

```
10 REM  Bouncing ball problem
20 REM
30 PRINT "How far does a bouncing ball
    travel"
40 PRINT "when dropped from a certain
    height?"
50 PRINT
60 REM
70 REM   Get initial height of ball
80 INPUT "Enter initial height of
    ball ";F
90 REM
100 REM   Initialize variables
110 T=0: REM   Cumulative distance
    travelled
120 R=0: REM   Distance travelled on the
    rise
130 B=0: REM   Bounce number
140 REM
150 REM   Print headings
160 PRINT
170 PRINT "Bounce No.","Distance
    travelled"
180 REM
190 REM   Watch ball until it stops
    moving
200 LT=T: REM   Previous travel
    calculation
210 T=T+R+F: REM   Add rise and fall to
    total
220 IF T=LT THEN 300: REM   Has ball
    stopped?
230 B=B+1: REM   Increment bounce number
240 PRINT B,T
250 R=.7*F: REM   Recalculate rise for
    next bounce
260 F=R: REM   Ball will fall as far as
    it rose
270 GOTO 200: REM   Go back and rise
    again
280 REM
290 REM   Ball has stopped moving
300 PRINT "Ball has stopped."
310 END
```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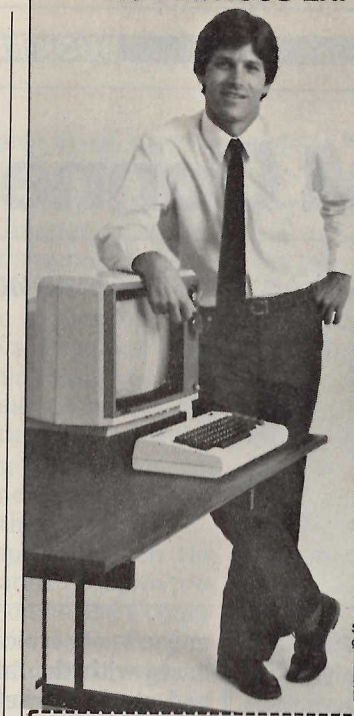

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The IBM Connection

A detailed introduction to telecommunications with the IBM PC

The IBM PC Connection: Telecommunications for the Home and Office

Neil L. Shapiro
Micro Text Publications/McGraw-Hill
New York, 1983
192 pages, softcover $16.95
Reviewed by Al Salciunas

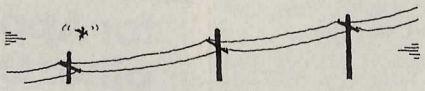
Like the systems they use, microcomputer enthusiasts are becoming more and more sophisticated. They avidly seek new ways of getting the most out of their digital wonders. It's for just such explorers that Neil Shapiro has written *The IBM PC Connection,* a step-by-step guide to

the vast world of telecommunications.

In its simplest form, telecommunications is based on a computer-to-computer connection via a telephone line. However, this one simple connection provides access to a growing universe of services, including databases with the latest news, sports, and stock market data; electronic mail systems; electronic bulletin boards for posting messages; and a host of other intriguing applications.

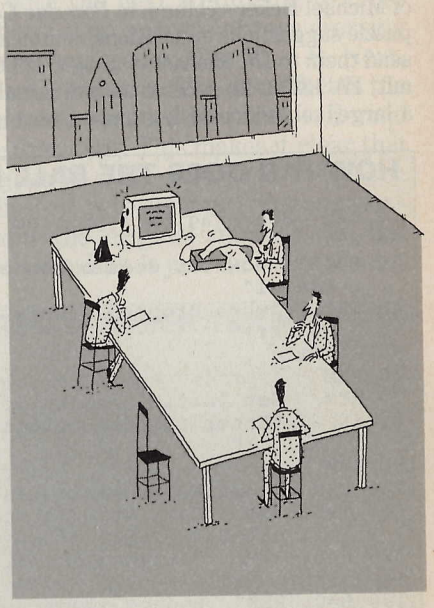
Setting Up

Although the majority of microcomputer systems can now be configured with modems and communications software, Shapiro has dedicated this book to the IBM Personal Computer. The author's recommended system configuration includes an IBM PC, a monochrome monitor, at least one floppy-disk



drive, a Smartmodem 1200 from Hayes Microcomputer Products, United Software Industries' ASCII Express-86 "The Pro" (AE-Pro) communications software program, and an Epson FX-80 or FX-100 dot-matrix printer. Although Shapiro goes on to say that other modems and printers are compatible with this particular arrangement, I would caution the reader not to take this too literally—many of the commands the author provides in the book are geared specifically to these devices.

Shapiro has loaded his book with concrete, useful information. For instance, he provides a detailed description of how each individual switch on the modem should be set. Also, he gives you the code for a program that "not only directs keyboard-entered commands to the modem, but also enables you to see on-screen what is happening." Although Shapiro praises the Hayes Smartmodem 1200 as "an excellent choice," he details steps you can take to make other modems behave similarly, including setting the parity, baud rate, duplex mode, and stop-bit switch.



After taking you through the steps of configuring the hardware, Shapiro turns his attention to the other important part of a telecommunications system: the terminal software.

A terminal program makes the

Al Salciunas is an associate editor for Datapro Research Corporation.

Illustration by Mark Kseniak

microcomputer act like, or "emulate," a terminal. The ASCII Express-86 program Shapiro recommends is one of the most powerful for the IBM PC. Shapiro offers clear instructions on how to access the program's various levels of menus and get the most out of the software.

Now that the hardware and software have been configured and installed, the reader is ready to make the first call. Shapiro recommends an initial call to a Public Access Message System, otherwise known as an electronic bulletin board. Bulletin boards, accessed by thousands of computer hobbyists and professionals, are services that let you read and write messages running the gamut from simple personal introductions to software debugging suggestions. Shapiro refers you to McGraw-Hill's "The Electronic Bookshelf" as an example. An appendix provides a list of hundreds of bulletin boards that you can access.

On-Line Information

The author next introduces information utilities such as The Source and Compuserve. While Shapiro concentrates on the many features offered by these two well-known services, you should be aware of the numerous other information utilities that offer similar services and shop around for the most suitable.

It is refreshing to see that Shapiro is conscious of the costs involved. On this score, he points out that there are two styles in which most utilities present their information: menu mode and command mode. The menu mode is easier for a beginner to use, but because you are paying for connect time, this mode becomes expensive as you continue to read huge menus. For this reason Shapiro suggests that when you become more proficient in the use of the information utility, you should employ the command mode, which enables you to access a particular option with only a few keystrokes.

After explaining how to access and find your way around in the information utilities, the author covers the features offered by The Source and Compuserve in great detail. Because these features are specifically described elsewhere in this issue (see "The Joy of Telecomputing," on page 107), we won't enumerate them again here. Suffice it to say that Shapiro provides a complete rundown on the available on-line information, electronic mail services, special-interest bulletin boards, and facilities for chatting with others on the utilities, giving the reader plenty of confidence and enthusiam for hooking up to either service.

Even more important than the amount of information Sharpiro provides about The Source and Compuserve, though, is the evaluative perspective he maintains throughout these descriptions. As suggested earlier, he is interested in saving your money and simplifying your telecommunications, and his item-by-item assessment of the features of the two services put them in sharp focus as far as convenience, ease of use, and specific value are concerned.

Up and Down

Probably the most powerful functions of a telecommunications utility are the uploading and downloading of information, Shapiro's next focus in *The IBM Connection*. Uploading is the process of composing messages off-line and transmitting the data from your disk to the information utility—a money saver when it comes to connect-time costs.

Conversely, the process of retrieving information and storing it on your computer's disk or random-access memory is called downloading. Shapiro makes it clear that much of the real power of telecommunications lies in mastering the art of uploading and downloading, and he guides you carefully to that mastery.

The final two chapters of *The IBM Connection* cover advanced techniques such as private networking and database management systems.

The simplest form of a private network is two computers connected by modems and transmitting over telephone lines. With such a network, you and a friend or colleague are able to "talk" to each other by typing messages. However, with a little more software, you can exchange files and software programs, thus utilizing the telecommunications capabilities of your system to a higher degree. Again Shapiro notes cost advantages: "The more information processing which can be moved onto your personal system and off the utilities which charge for connect time, the greater will be your savings." To avoid an avalanche of paper and a multitude of disks, Shapiro suggests a database management package. As he points out, "Databases are one of the main ways that a personal computer can organize information, detail by detail. As more and more information is received by computer from other computers, it will become even more desirable to have a database program with a telecommunications capability."

This short summary barely does justice to the amount of useful information Shapiro has packed into *The IBM Connection*. This book is exactly the sort of volume that will help you get more out of your system. Shapiro has succeeded in conveying his material clearly—the book is easy to read and avoids unnecessarily technical terms. For the IBM PC owner interested in telecommunications, the book will be a real boon. For others, it provides valuable information in an accessible style. □

State of the Art: A Photographic History of the Integrated Circuit

Stan Augarten
Ticknor & Fields
New Haven, CT, 1983
79 pages, softcover $9.95
Reviewed by William Keough

First, let me say I think this is a wonderful book. Stan Augarten has written a crisp, illustrated history of the action on integrated circuits, revealing that these chips seem to teem with molecular life.

Augarten provides a concise introduction to the state of the art and offers brief descriptions and match-

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ing photographs of about 40 of the most important and revolutionary breakthroughs. History that could have been merely silly is instead illuminating; the photographs that could have been repetitious are always intriguing and often beautiful.

In the foreword Ray Bradbury invokes the treasures of the art world to suggest his own sense of wonder: "First cousins to the cloisonné dish, the Persian carpet, the Vatican mosaics; what miniature panoplies live here. And live *is* the word. For not only do these laboratory-found objects look vital, they are juiced with creation. All the stuffs and junks and fabulous dreams of once sleepless men are shelved, stashed, and eye-droppered here."

My word, Ray, *all*? But perhaps an old science-fiction hand like Bradbury, who admits to having been unable to predict or even suspect the actual computer revolution, has a right to gush. Certainly, since the first Bell Labs point-contact transistor in 1947, the integrated circuit has made quantum leaps. These photographs, then, are an encapsulated record of the millions of man-hours and the dozens of technological breakthroughs. Who could have believed that our tiny silicon chips could harbor such glorious symmetries, such subtle harmonies?

As Augarten points out, most of these photos (provided by the manufacturers) were taken with a Zeiss Ultraphot or similar microscope camera that employs a three-dimensional optical effect known as differential interference contrast. The often brilliant colorings are a result of the photographic process rather than in the chips themselves. But, tricks aside, the compositions are still stunning and suggest comparisons to the art world. The 1950 "junction transistor" looks like a rough primitive of a mud turtle being pulled by two iron horses; the A709 Operational Amplifier brings to mind the wild vorticism of Fernand Léger; the cool Escher-like geometry of gallium arsenide chips conveys an intricate superrealism.

To flip through this book is to see with one's own eyes how computer experts have compressed an eon of technological breakthroughs into a generation of human time. Most satisfying, this is a rare aesthetic triumph in a field too often glutted with tasteless functionalism. For anyone who loves computers, these pictures of their tiny hearts, packed attractively into a convenient album, should be a pleasure. Kudos, Mr. Augarten, many kudos. □

MICRO REVIEWS

by Mike Nicita and Ron Petrusha

Communications and Networking for the IBM PC

by Larry E. Jordan and Bruce Churchill
Brady Press, Bowie, MD, 1983, 288 pages, softcover $19.95

This is the first serious, popularized study of communications for professional users. Though hobbyists will be able to learn about The Source and Compuserve, the main focus of *Communications and Networking for the IBM PC* is the business of communications: costs, efficiencies, local area networks, and, above all, applications. After preliminaries that introduce general concepts and protocols, the book focuses on one of the hottest developments in communications applications: local area networks (LANs). PCnet, Omninet, and Etherlink are analyzed with respect to costs, speed, and applications flexibility. This volume is a good investment for professionals interested in both a readable introduction to communications and a valuable reference work.

Exploring the IBM PCjr Home Computer

by Peter Norton
Microsoft Press, Bellevue, WA, 1984, 336 pages, softcover $18.25

Peter Norton has gained a considerable reputation as a microcomputer author who specializes, in his

own words, in topics drawn from "the deep end of the pool." Traditionally, it has been intermediate and advanced users who are most adept at fathoming his complex subjects, and this current offering is no exception. The second book in a Microsoft PCjr series that begins with *Discovering the IBM Home Computer/PCjr* and a supplement to *Using DOS on the IBM PCjr*, Norton's book demands both a familiarity with the PCjr and some previous programming experience. Norton dissects the hardware and software of the PCjr, sharing his observations and insights as the rest of us peer over his shoulder. Besides the immediate bonuses for PCjr users (a "hidden" communications program in Cartridge BASIC is one of many examples), Norton's book offers an excellent introduction to 8088 assembly-language programming. All PCjr users interested in honing their expertise on this newly introduced machine will benefit from Norton's explorations.

The TRS-80 Model 100 Portable Computer

by David A. Lien
Compusoft, El Cajon, CA, 1983, 555 pages, softcover $19.95

With *The TRS-80 Model 100 Portable Computer*, David Lien maintains his reputation as a premier BASIC educator. All Model 100 users with a penchant for BASIC programming will find this volume both enjoyable and educational. Lien also provides a guide to Model 100 hardware and applications software that helps to impart an operational mastery of the machine. Appropriately, he devotes close attention to TELECOM, the communications program that accounts for much of the machine's popularity. But the bulk of the book is devoted to BASIC programming. Its 50 chapters span the gamut of Model 100 BASIC topics, starting with PRINT and ending with PEEK, POKE, and the handling of peripherals. Novices will find themselves almost effortlessly acquiring a knowledge of Model 100 BASIC. For those who wish to explore programming the Model 100, we can think of no finer place to begin.

Controlling Financial Performance for Higher Profits with Visicalc

by Dennis P. Curtin, Jeffrey R. Alves, and Anne K. Briggs
Curtin and London, Somerville, MA, 1983, 168 pages, softcover $15.50 ($40.50 with disk)

One of Curtin and London's Business User Guides, this very effective volume employs Visicalc (either regular or advanced versions on an Apple II, IIe, or III) to analyze financial statements and ratios. We recommend not only the text, but the book/disk package as well; rarely have content, design, and disk-based presentation combined so well to introduce the business person to the power of electronic spreadsheets. The introductory chapters of the book serve as a primer for both the use of Visicalc and the development of financial statements. Novices to the business and microcomputer worlds can derive a working knowledge of both from the authors' superb presentation. Graphics and effective typography are used to step you through Visicalc functions, and asides address both business and Visicalc topics. The disk accompanying the book contains five Visicalc templates for examples developed by the authors. Each template, like the general text from which it is drawn, offers a practical, immediately usable planning tool that can be easily modified by the user. In short, this is among the best executive Visicalc tutorials we've read.

Your IBM PC Made Easy

by Jonathan Sachs
Osborne/McGraw-Hill, Berkeley, CA, 1983, 250 pages, softcover $12.95

Your IBM PC Made Easy is not one of those volumes that oversimplifies PC operation. Instead, it actually makes using the PC easy by eliminating topics (such as BASIC programming) of little interest to the applications-minded business person. Sach's highly practical guide to computer selection and operation is tailored to the needs of this pragmatic audience. Early lesson-oriented chapters quickly give a working knowledge of DOS; only the discussion of DOS 2.0's advanced file-handling features could have been more detailed. The second section of the book examines resources including hardware, software, supplies, accessories, dealers, and services. This is not, however, a directory of resources—Sachs either examines available options (in the chapters on hardware or software) or the considerations involved in making a choice (in his treatment of dealers and services). This dual focus both informs the reader of available PC applications and outlines considerations which many practical guides overlook; the gathering of concrete information about products and services, however, is left to the reader. The final third of the book provides a useful reference guide to operations, problem determination, and error messages. Overall, businessmen and professionals who are not concerned with programming or understanding the inner workings of their PCs will find that Sach's practical approach does indeed make component selection and overall operation easier.

Sprite Graphics for the Commodore 64

by Sally Greenwood Larsen
Prentice-Hall, Englewood Cliffs, NJ, 1983, 184 pages, softcover $15.95

For those hapless users who have read about sprite graphics in the *Commodore 64 User's Guide* but have so far been able only to "type in the sample Sprite program and watch the three balloons float around on the screen," *Sprite Graphics for the Commodore 64* comes to the rescue by providing a simple, step-by-step approach to the construction of sprites and the implementation of sprite graphics.

Larsen thoroughly treats each step involved in using sprite graphics, including defining sprites and their colors, storing sprite data in memory, enabling sprites, positioning them on the screen, and detecting collisions. More complex topics, such as animation and the use of multicolor sprite graphics, are also handled well. Sample programs in one of the concluding chapters nicely illustrate most of the concepts conveyed earlier in the text. *Sprite Graphics for the Commodore 64* promises to transform each reader into a graphics programmer.

Secrets of Better BASIC

by Ernest Mau
Hayden, Hasbrouck Heights, NJ, 1983, 256 pages, softcover $16.95

Despite advances in microprocessor speeds, software development has continued to emphasize an incoherent collection of methods for accelerating program execution. In *Secrets of Better BASIC*, Mau confronts this contradiction by substituting an empirical approach for the prevailing techniques of programming. Mau carefully records the actual improvements in efficiency resulting from the use of more speed-conscious code on five BASIC interpreters. The book is clearly organized, with entire topics such as numerical storage and precision, functions, strings, subroutines, loops, and variable placement receiving systematic attention. Given his advanced audience, it is unfortunate that Mau includes a rehash of elementary BASIC commands in the first four chapters of his text. Also, he fails to explore one advanced programming technique—that of replacing slow BASIC code with machine-language subroutines. Although it should have focused more consistently on the advanced programmer's needs, *Secrets of Better BASIC* is still obligatory reading for those concerned with writing more efficient BASIC programs.

Your First BASIC Program

by Rodnay Zaks
Sybex, Berkeley, CA, 1983, 150 pages, softcover $9.95

Rodnay Zaks, one of the more prolific writers about computers, here teams with artist Daniel Le Novry to fashion a leading example of the "microcomputer menagerie" approach to BASIC introductions—Zak's text actually serves as the backdrop for a stage populated by Le Novry's creatures. BASIC instructions, joined in a "Program Snake," are guided by a gloating microprocessor to the point where they are summarily "executed" by the computer. Variables are differentiated as either numeric or alphanumeric by the shape of their antennae ($ for alpha), and REM statements literally "pass through" the BASIC interpreter undetected. Minimal BASIC programming skills are treated in this sugar-coated introduction "for children of all ages." While average readers will not become fluent BASIC programmers by reading this text—it's more style than substance—they will certainly have fun trying.

Commodore 64/VIC-20 BASIC

by Richard Haskell and Thomas Windeknecht
Prentice-Hall, Englewood Cliffs, NJ, 1984, 200 pages, softcover $13.95

Although books for intermediate and advanced users of the VIC-20 and Commodore 64 have been both numerous and often of high quality, the same has not been true of introductory works. But now Haskell and Windeknecht's new introduction to Commodore BASIC fills this need more than adequately. The book covers virtually all of BASIC, beginning with the PRINT statement and concluding with machine-specific features (sound programming on both computers and sprite graphics

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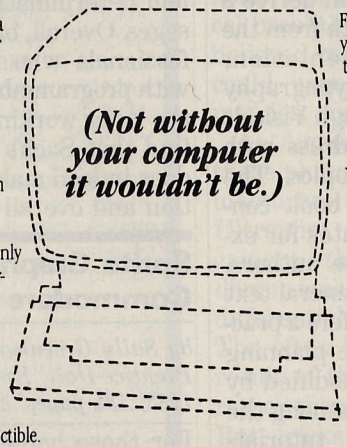

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on the Commodore 64). In between, the authors provide solid, detailed examinations of such topics as implementing the full range of looping and branching structures in BASIC, handling program and data files, using PEEK and POKE commands, and other issues often treated only in "advanced" texts. In short, *Commodore 64/VIC-20 BASIC* does a fine job of providing a comprehensive introduction to Commodore BASIC programming.

Word Processing and Beyond

by Fred Stern
John Muir, Santa Fe, NM, 1983, 223 pages, softcover $9.95

Even before familiarizing the reader with the barest essentials of computing (such as the distinction between a microcomputer and a dedicated word processor), the opening of *Word Processing and Beyond* launches directly into the task of providing an operations manual for an imaginary word-processing system. The most user-hostile of word-processing manuals becomes inviting by comparison. Material which should have introduced the book is "saved" for later development. Here Stern emphasizes the need to select software before hardware, notes the existence of utility and accessory programs (mailing list programs, dictionaries, etc.), and finally presents a typology of word-processing hardware and software that distinguishes between microcomputers and dedicated word processors. This discussion is curtailed, however, as the author attempts to move "beyond" word processing, which indicates a desire to avoid an even moderately comprehensive treatment of word processing by randomly focusing on sundry computing topics. A smattering of virtually every topic of interest to anyone is given at least passing mention in a series of chapters notable only for their superficiality. Stern has supposedly moved "beyond" word processing. In fact, he has done so only by evading it.

Computer Gamesmanship

by David Levy
Simon & Schuster, New York, 1984, 288 pages, softcover $12.95

David Levy is the author and co-author, respectively, of *Chess and Computers* and *More Chess and Computers*. In his latest work, chess and other games serve as background material for a discussion of "evaluative heuristics." Used frequently in the jargon of artificial intelligence experts, this term refers loosely to the methods a computer employs to arrive at a solution to a problem. Its strict interpretation and application are what raises *Computer Gamesmanship* far above the level of other learn-how-to-program-while-creating-neat-games anthologies. The games that form the stepping stones of Levy's discussion include backgammon, Othello, bridge, dominoes, and chess. Developments in the evolution of artificial intelligence are interspersed with game-specific information, making this simply an ingenious, innovative introduction to concepts fundamental to artificial intelligence.

The Computer Cookbook

by William Bates
Prentice-Hall, Englewood Cliffs, NJ, 1983, 380 pages, softcover $8.95, hardcover $21.95

The depth to which the entries in *The Computer Cookbook* are explored is startling. From detailed instructions for playing Star Trek to a comparison of CP/M-86 and MS-DOS as competing IBM PC operating systems, Bates's work shows years of research. Subtitled "How to Create Small Component Systems That Work for You," the book explains a number of microcomputer topics in useful detail. (Its text, however, is the raw output of a

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Diablo printer—the *Cookbook*'s designers should have paid a little more attention to the author's discussion of ease of use.) Retail and discount prices of hardware and software are listed, as are the phone numbers and addresses of local on-line information services and 500 microcomputer-related companies. You'll also find the best stack-level explanation of the recursive features of Ada and Pascal in the literature.

The Elements of Friendly Software Design

by Paul Heckel
Warner Books, New York, 1984, 224 pages, softcover $9.95

While *The Elements of Friendly Software Design* stresses the role of creativity and artistic ability in designing effective software, the book offers inadequate testimonial to the "programming as an art form" school. Rather than developing his argument that "writing easy-to-use software is a communications craft," Heckel simply repeats it ad nauseum by rephrasing it in a myriad of ways, shapes, and forms. The book seems to be a high-pressure sales attempt aimed at a particular audience—those software engineers who have previously taken the user-software interface for granted. Heckel is at his best when his tone is clearly polemical (as in his attack on structured programming). Despite his claim that the phrase "user-friendly software" has lost all meaning, the author fails to revitalize the term.

Graphics for the Commodore 64 Computer

by Jeff Knapp
Prentice-Hall, Englewood Cliffs, NJ, 1984, 150 pages, softcover $14.95; hardcover $29.95

Not only does Knapp succeed in the difficult task of covering each of the graphics modes of a surprisingly sophisticated computer, he does it with a level of detail that makes this an outstanding work on machine-specific graphics programming. *Graphics for the Commodore 64 Computer*, however, is not for beginners. Both proficiency in BASIC and a working knowledge of Boolean algebra are assumed throughout, and a familiarity with 6502 assembly language is helpful. Knapp's discussion of each graphics mode focuses almost exclusively on Commodore 64 hardware and the computer's memory map, with comparatively little on graphics programming techniques. The attention Knapp devotes to each graphics mode varies, with extended background color and multicolor high-resolution graphics receiving relatively brief treatments. But despite this, *Graphics for the Commodore 64 Computer* provides an outstanding overview of this computer's powerful graphics capabilities. All intermediate and advanced users will find it rewarding. □

Mike Nicita and Ron Petrusha are coauthors of *Reader's Guide to Microcomputer Books* (Golden-Lee).

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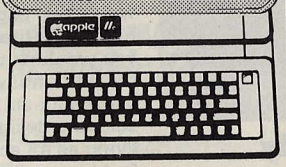

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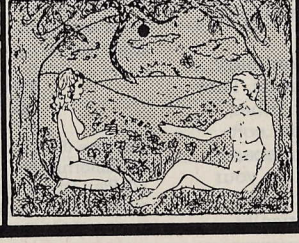

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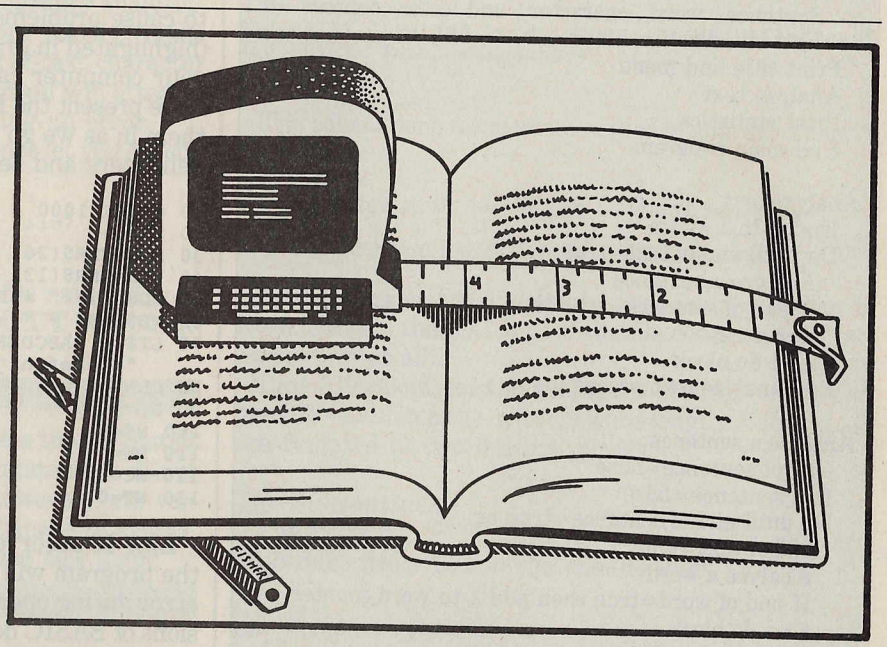
The Text Scanner

Program your computer to test the readability of any writing sample

by George Stewart



What makes good writing? Many factors are involved, and some of them (style, for instance) are quite difficult to evaluate using a computer. Others, however, are well suited to the computer's statistical capabilities. One such factor is readability, a measure that helps you determine how easy a writing sample is to read.

This month, we present a program that calculates two key factors of readability: average sentence length and average word length. With the program, you'll be able to examine your own writing samples as well as your favorite passages from literature. You can compare the analyses of samples from scientific journals, newspapers, children's books, and so forth. From this comparison you can begin to see how sentence length and word length affect readability and see what role they play in different kinds of writing. You might even try using the results to make your own writing more effective for different kinds of audiences.

The program can read word-processing documents stored in disk files as well as samples you type in on the keyboard.

Beyond its immediate applications, The Text Scanner illustrates several techniques useful for other kinds of text processing, such as natural language processing and command interpreting.

Program Logic

In developing The Text Scanner, we started with the outline shown on page 200. The outline is written in a near-English form called pseudo-code. Programmers often find pseudo-code helpful because it provides a way to plan out a program without getting bogged down immediately in the intricacies of BASIC.

The pseudo-code here emphasizes the program's logical structure: it consists of a main program with three auxiliary procedures. In the actual BASIC program, we treat these procedures as subroutines. In the pseudo-code outline, an underscore is used to connect words that correspond to a single entity (a variable or a procedure).

The Text Scanner counts sentences, words, and letters. The task sounds simple, but there are a few complexities:

To count sentences, the program looks for *sentence delimiters* (a period, exclamation point, or question mark). But problems arise if the text contains an ellipsis (three periods in a row) or if an emphatic passage ends with two exclamation points. The program cannot assume that a sentence has ended each time it reads a delimiter.

George Stewart is a contributing editor of *Popular Computing*.

Illustration by Mark Fisher

Similarly, to count words, the program looks for *word delimiters*—spaces, hyphens, and carriage returns. Again, the program must watch for sequences of two or more delimiters; otherwise a double hyphen, for example, seems to mark two words instead of one.

To keep track of whether a delimiter is significant or not, we use the true or false variables shown in the pseudo-code: in-a-sentence, in-a-word, end-of-text, end-of-sentence, and end-of-word.

Other punctuation also requires special handling. Apostrophes, for example, must not be treated as word delimiters; otherwise "didn't" would be treated as two words. These punctuation marks must also be ignored in counting the length of a word.

Pseudo-code for The Text Scanner

This pseudo-code shows the logical structure of the program. Words connected by underscores are treated as single variables or procedures in the program.

```
Main Program:
  Initialization:
    Sentence_delimiters are: period, exclamation point,
      question mark, and end_of_text marker
    Word_delimiters are: sentence_delimiters, space,
      hyphen, and end_of_line
    Letters are: upper and lowercase alphabet
    Sentence_, word_, character_, and letter_counters =0
    End initialization block
  Print title and menu
  Analyze text
  Print statistics
  End main program

Analyze_text
  End_of_text=false
  Do until end_of_text=true:
    Analyze_a_sentence
    If end_of_sentence=true then add 1 to sentence_
      counter
    End do_block
  End analyze_text procedure

Analyze_a_sentence
  End_of_sentence=false
  In_a_sentence=false
  Do until end_of_sentence=true or
    end_of_text=true:
    Analyze_a_word
    If end_of_word=true then add 1 to word_counter
    End do_block
  End analyze_a_sentence procedure

Analyze_a_word
  End_of_word=false
  In_a_word=false
  Do until end_of_word=true or end_of_sentence=true
    or end_of_text=true:
    Get character C
    If C=end_of_text_marker then end_of_text=true
    If C is a letter of alphabet then do:
      If in_a_word=false then in_a_word=true
      If in_a_sentence=false then in_a_sentence=true
      Add 1 to letter_counter
      End if_block
    If C is a word_delimiter then do:
      If in_a_word=true then end_of_word=true
      If C is a sentence_delimiter and in_a_sentence=
        true then end_of_sentence=true
      End if_block
    If end_of_text=false then add 1 to character_counter
    End do_block
  End analyze_a_word procedure
```

The Main Program

The program is written in Microsoft BASIC and should run with little or no modification on most personal computers. Where language difficulties are likely to cause problems, we offer alternative program lines (highlighted in gray); type these in only if you are sure your computer cannot use the main program lines.

We present the BASIC program in logical blocks. Type them in as we go along. The first block defines certain delimiters and sets the various counters to zero:

```
10 CLEAR 1000
20 REM
30 ET$=CHR$(26)
40 EL$=CHR$(13)
50 SD$=".!?" + ET$
60 WD$=SD$ + " -" + EL$ + QT$
70 LT$ = "ABCDEFGHIJKLMNOPQRSTUVWXYZ" +
     "abcdefghijklmnopqrstuvwxyz"
80 CR=0
90 EL=1
100 NS=0
110 NW=0
120 NC=0
130 NT=0
```

Line 10 reserves 1000 bytes for string processing so the program will not generate an "out of string space" error during operation. Applesoft and certain other versions of BASIC do not need this line. Check your BASIC reference manual to find out if you must use CLEAR to reserve string space. If you don't, delete line 10.

The strings SD$, WD$, and LT$ in lines 50, 60, and 70 are used later in conjunction with the INSTR function. Be sure to include a single space before the hyphen in line 60. If your computer doesn't have INSTR, omit lines 50, 60, and 70.

ET$ is an arbitrarily chosen end-of-text character. We've assigned it the value of Control-Z, but any nontext character can be used. With Applesoft and Commodore BASIC the character you choose for ET$ must be the same one you use to mark the end of your text file. When the program reads a character matching ET$, it sets the end-of-text flag to 1, or true. (Throughout the program, 0 indicates false and 1 indicates true.)

EL$ is the end-of-line character stored when you press Return or Enter; it counts as a word delimiter. CR stores the number of characters that remain in the text input buffer. EL is another status variable used in the keyboard input logic. NS, NW, NC, and NT count the

number of sentences, words, characters, and letters, respectively.

The next block prints a title and menu:

```
140 PRINT "The Text Scanner"
150 PRINT
160 PRINT "Input from: 1-Keyboard  2-Disk"
170 INPUT "(Select 1 or 2) "; IM
180 IF IM<1 OR IM>2 THEN 160
190 IF IM=1 THEN 220
```

Before using option 2 (input text from disk), you must have a text file on the disk, created with a word-processing program. The file should contain the same type of information that might be entered from the keyboard. Carriage returns are treated as word delimiters. Other control characters, such as line feeds, tabs, and form feeds, have no effect on the program's analysis.

If you use Applesoft or Commodore BASIC, make sure your disk file ends with the end-of-text character specified as ET$. Otherwise the program will attempt to read past the end of file, generating an error.

If you select option 2, the following lines let you specify the input file name:

```
200 LINE INPUT "Name of the input file? "; FI$
210 OPEN "I", #1, FI$
```

Line 200 prompts you to enter the file name. If your computer doesn't have the LINE INPUT statement, use this line instead:

```
200 INPUT "Name of the input file "; FI$
```

The OPEN statement in line 210 opens the file matching the specification FI$. The OPEN statement shown here is suitable for IBM PC BASIC; however, your version of BASIC might require minor changes in syntax. Many versions of Microsoft BASIC use this form:

```
210 OPEN "I", #1, FI$
```

Applesoft BASIC uses this form:

```
210 PRINT CHR$(4); "READ "; FI$
```

Commodore BASIC uses this form:

```
210 OPEN 1, 8, 2, FI$
```

To find out how to open a text file for sequential input on other computers, check the OPEN statement in your BASIC reference manual.

In you don't have a disk system, you can simply use these lines:

```
200 PRINT "Disk input not available yet."
210 IM=1
```

The next block performs the analyze-text procedure:

```
220 ET=0
230 GOSUB 370
240 IF ES=0 THEN 260
250 NS=NS+1
260 IF ET=0 THEN 230
```

At the beginning of this routine, ET is set equal to false. The subroutine called in line 230 analyzes a word. Line 240 checks to see whether a sentence was ended during the analyze-a-word subroutine. If so, the program increments the sentence counter and then checks to see whether the end of text was reached. If not (ET=0), the program jumps back to line 230 to repeat the analyze-a-sentence procedure.

If the end of text has been reached (ET=1), the next block prints the statistics and ends the program:

```
270 PRINT
280 PRINT "Sentences: "; NS
290 PRINT "Words: "; NW
300 IF NW=0 THEN 350
310 SA=INT(NW/NS*100+.5)/100
320 WA=INT(NT/NW*100+.5)/100
330 PRINT "Average sentence length: "; SA; "
     words"
340 PRINT "Average word length: "; WA; " letters"
350 PRINT "Total characters: "; NC
360 END
```

The calculations for average sentence and word length are simple:

Average sentence length = words/sentences

Average word length = letters/words

Line 300 prevents division by zero in case no words were found in the text (e.g., if the file contained no text characters at all).

Line 310 calculates the average sentence length, and line 320 calculates the average word length. Both values are rounded to two decimal places.

The Subroutines

The following block performs the analyze-a-sentence procedure described in the pseudo-code:

```
370 ES=0
380 IS=0
390 GOSUB 440
400 IF EW=0 THEN 420
410 NW=NW+1
420 IF ES=0 AND ET=0 THEN 390
430 RETURN
```

After the end-of-sentence and in-a-sentence flags are set equal to 0 (false), line 390 calls the analyze-a-word subroutine. If a word was ended during the subroutine, the program adds 1 to the word total. If the program has found neither the end of a sentence nor the end of the text (ES=0 or ET=0), it goes back to the analyze-a-word subroutine.

If a sentence has ended or the end of text has been reached, the subroutine ends and returns control to the main program.

Here's the analyze-a-word subroutine:

```
440 EW=0
450 IW=0
460 ON IM GOSUB 600,770
470 IF C$=ET$ THEN ET=1
480 IF C$=ET$ OR INSTR(1,LT$,C$)=0 THEN 530
490 IF IW=0 THEN IW=1
```

```
500 IF IS=0 THEN IS=1
510 NT=NT+1
520 GOTO 560
530 IF INSTR(1,WD$,C$)=0 THEN 560
540 IF IW=1 THEN EW=1
550 IF INSTR(1,SD$,C$)>0 AND IS=1 THEN ES=1
560 IF ET=1 THEN 590
570 NC=NC+1
580 IF EW=0 AND ES=0 AND ET=0 THEN 460
590 RETURN
```

The end-of-word and in-a-word flags are set to 0 (false). Then the program gets a character from the text buffer. Line 460 gets the character from the keyboard or the disk file, depending on the value of IM, which you specified previously.

Upon return from either subroutine (at line 600 or 770), C$ contains the character. If the end of text was reached, C$ is equal to the special end-of-text character ET$; in that case, line 470 sets the end-of-text flag to 1 (true).

Line 480 determines whether C$ is a letter. If it is, lines 490 to 510 make the necessary changes to the in-a-word flag, in-a-sentence flag, and letter counter.

The INSTR function searches for the first occurrence of C$ inside LT$.

If your version of BASIC does not have the INSTR function (Applesoft and Commodore BASIC do not), use this line instead:

```
480 IF C$=ET$ OR C$<"A" OR C$>"z" OR (C$>"Z" AND C$<"a")
    THEN 530
```

If you don't want to handle lowercase letters, change line 480 to:

```
480 IF C$=ET$ OR C$<"A" OR C$>"Z" THEN 530
```

Line 530 determines whether C$ is a word delimiter. If it is, line 540 checks the status of the in-a-word flag; if the flag is 1 (true), the delimiter ends the word, setting the end-of-word flag EW to 1.

If your computer doesn't have the INSTR function, use this line instead:

```
530 IF C$ <> " . " AND C$ <> " ! " AND C$ <> " ? " AND C$
    <> CHR$(32) AND C$ <> " - " AND C$ <> EL$ THEN 560
```

Line 550 checks whether C$ is a sentence delimiter and changes the end-of-sentence flag EF if appropriate.

For computers without the INSTR function, use this line instead:

```
550 IF (C$ = " . " OR C$ = "!" OR C$ = "?") AND IS = 1 THEN
    ES = 1
```

Line 570 adds 1 to the character count unless C$ is the end-of-text character, which doesn't figure in the total.

If the end-of-word, end-of-sentence, and end-of-text flags are all 0 (false), the program jumps back to get another character. If any of the flags are 1 (true), the subroutine ends and returns to the analyze-a-sentence routine.

Keyboard Input Subroutine

The keyboard input subroutine lets you enter text without worrying about line breaks: you can press Return (Enter on some computers) after any word or sentence. But be sure not to press Return in the middle of a word because Return counts as a word delimiter. To end keyboard entry, press Return on an empty line or type the end-of-text character.

Here's the logic to handle keyboard input:

```
600 C$=ET$
610 IF CR>0 THEN 730
620 IF EL=1 THEN 660
630 C$=EL$
640 EL=1
650 GOTO 760
660 PRINT
670 PRINT "Enter text (type an empty line to
     quit)"
680 B$=""
690 LINEINPUT B$
700 BL=LEN(B$)
710 CR=BL
720 IF CR=0 THEN 760
730 EL=0
740 C$=MID$(B$,BL-CR+1,1)
750 CR=CR-1
760 RETURN
```

C$ is initially set to the end-of-text marker. The subroutine returns with this character only if you press Return on an empty line or type the end-of-text character within a line.

The subroutine draws characters one at a time from a buffer, B$. When the buffer is empty (CR=0), the program prompts you to enter another line (lines 670 to 760). However, before doing this, the program must account for the Return you pressed to end the line. Line 630 sets C$ to this character and jumps to the end of the subroutine.

However, suppose you pressed Return on an empty line to signify the end of text. In this case only, EL is set equal to 0 (line 730) so that the next time the program tries to read the buffer, line 620 discovers that EL = 0 and does not try to get another line of input.

Line 690 uses the LINE INPUT statement to get the next line of text from the keyboard. LINE INPUT is preferable to simple INPUT because it accepts every text character typed up to the carriage return, including commas and colons.

If your version of BASIC does not have LINE INPUT (Applesoft and Commodore BASIC do not), use these lines instead:

```
670 PRINT "Type a quote, then enter text:"
680 B$=" "
690 INPUT B$
```

Note that line 670 prompts you to start each line with a quote; this prevents the INPUT routine from stopping at the first comma or colon found in the line of text. There are no spaces between the quotes in line 680. The initial quote is not required if you use the LINE INPUT statement.

Disk Input Subroutine

The following lines read from a text file:

```
770 C$=ET$
780 IF CR>0 THEN 840
790 IF EOF(1) THEN 880
800 LINE INPUT #1, B$
810 IF LEN(B$)<255 AND NOT(EOF(1)) THEN B$=B$+EL$
820 BL=LEN(B$)
830 CR=BL
840 C$=MID$(B$,BL-CR+1,1)
850 PRINT C$;
860 CR=CR-1
870 GOTO 890
880 CLOSE #1
890 RETURN
```

C$ is set to the end-of-text marker. The subroutine returns with this character only if it detects the end of file or reads the end-of-file character.

The subroutine draws characters from a buffer, B$. When the buffer is empty (CR=0), line 790 checks to see if the end of file has been reached. If EOF(1) =1 (true), line 880 closes the file. If EOF(1) = 0 (false), the program reads another line of text.

For Applesoft BASIC, use these lines instead of lines 770 to 890:

```
770 GET C$
780 IF C$=ET$ THEN PRINT CHR$(4); "CLOSE "; FI$
790 RETURN
```

If you have Commodore BASIC, use these lines instead of lines 770 to 890:

```
770 GET 1,C$
780 IF C$=ET$ THEN CLOSE 1
790 RETURN
```

To use Applesoft and Commodore BASIC disk routines, remember that your text file must end with the character specified as ET$. To add the end-of-file character to your text file, edit the file with a word processor, skip to the end of the file, and type the character Control-Z (or whatever you specify in line 30).

Sample Results

We ran the program to measure passages from two magazines and two authors: *Popular Computing* (PC), *Scientific American* (SA), William Faulkner (WF), and Ernest Hemingway (EH). The results were as follows:

	PC	SA	WF	EH
Avg. sentence	15.86	14.2	20.55	16.92
Avg. word	5.26	4.76	3.92	4.46

Where does your writing fall on the scale? □

If you have questions about this program or suggestions for future projects, send them to: George Stewart, The Program Factory, R.F.D. #1, Box 802, Hancock, NH 03449. Please include a self-addressed, stamped envelope if you want a reply. For programming questions, include a printer listing and sample run of the program.

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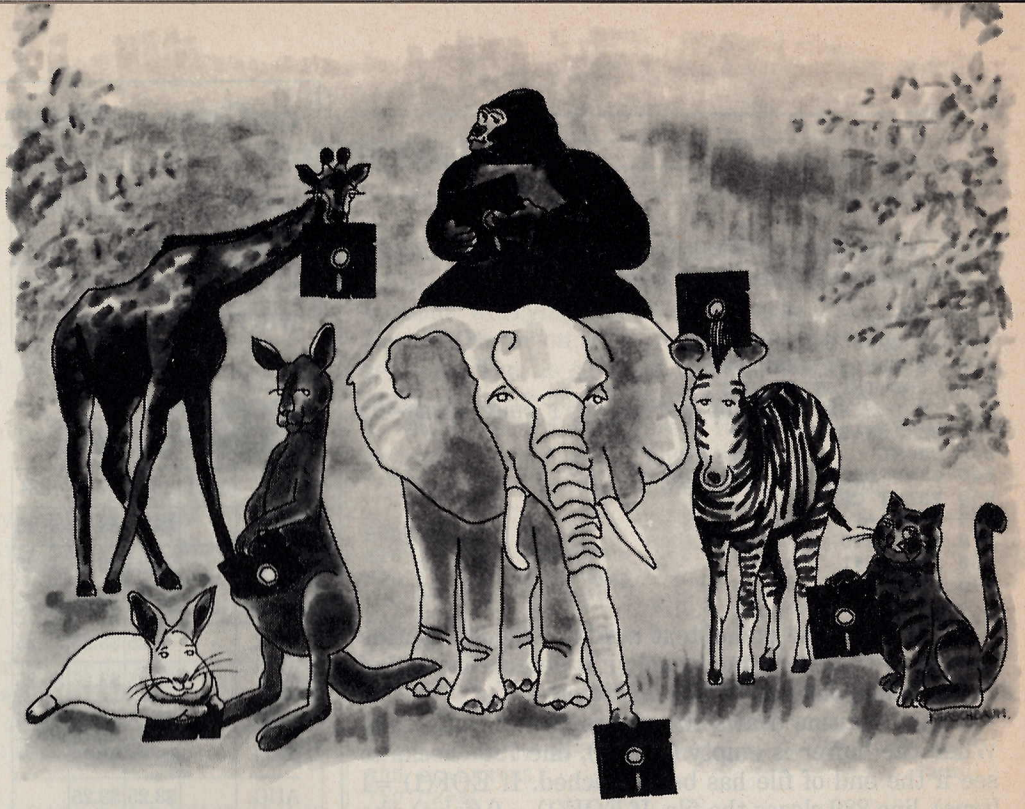

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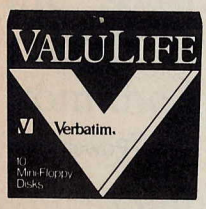

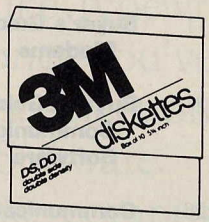

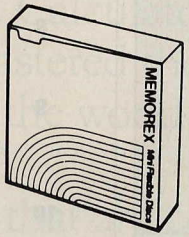

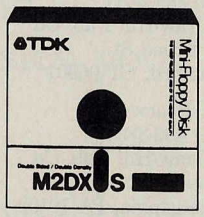

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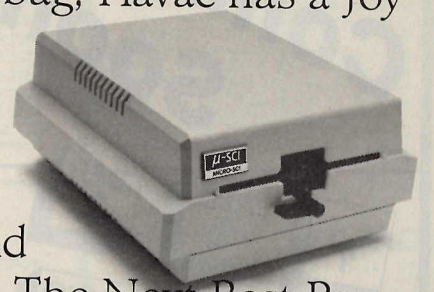

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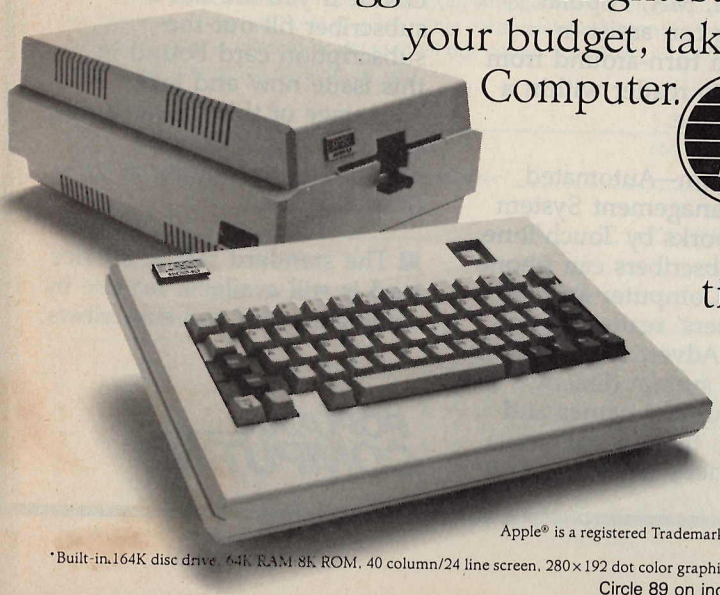

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7	27	37	47	57	67	77	87	97	107	117	127	137	147	157	167	177	187	197	207	217	227	237	247	257	267	277	287	297
8	28	38	48	58	68	78	88	98	108	118	128	138	148	158	168	178	188	198	208	218	228	238	248	258	268	278	288	298
9	29	39	49	59	69	79	89	99	109	119	129	139	149	159	169	179	189	199	209	219	229	239	249	259	269	279	289	299
0	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300

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Good	2	6	10	14	18	22	26	30	34	38	42	46	50
Fair	3	7	11	15	19	23	27	31	35	39	43	47	51
Poor	4	8	12	16	20	24	28	32	36	40	44	48	52

Article no.	14	15	16	17	18	19	20	21	22	23	24	25
Excellent	53	57	61	65	69	73	77	81	85	89	93	97
Good	54	58	62	66	70	74	78	82	86	90	94	98
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	25	35	45	55	65	75	85	95	105	115	125	135	145	155	165	175	185	195	205	215	225	235	245	255	265	275	285	295
	26	36	46	56	66	76	86	96	106	116	126	136	146	156	166	176	186	196	206	216	226	236	246	256	266	276	286	296
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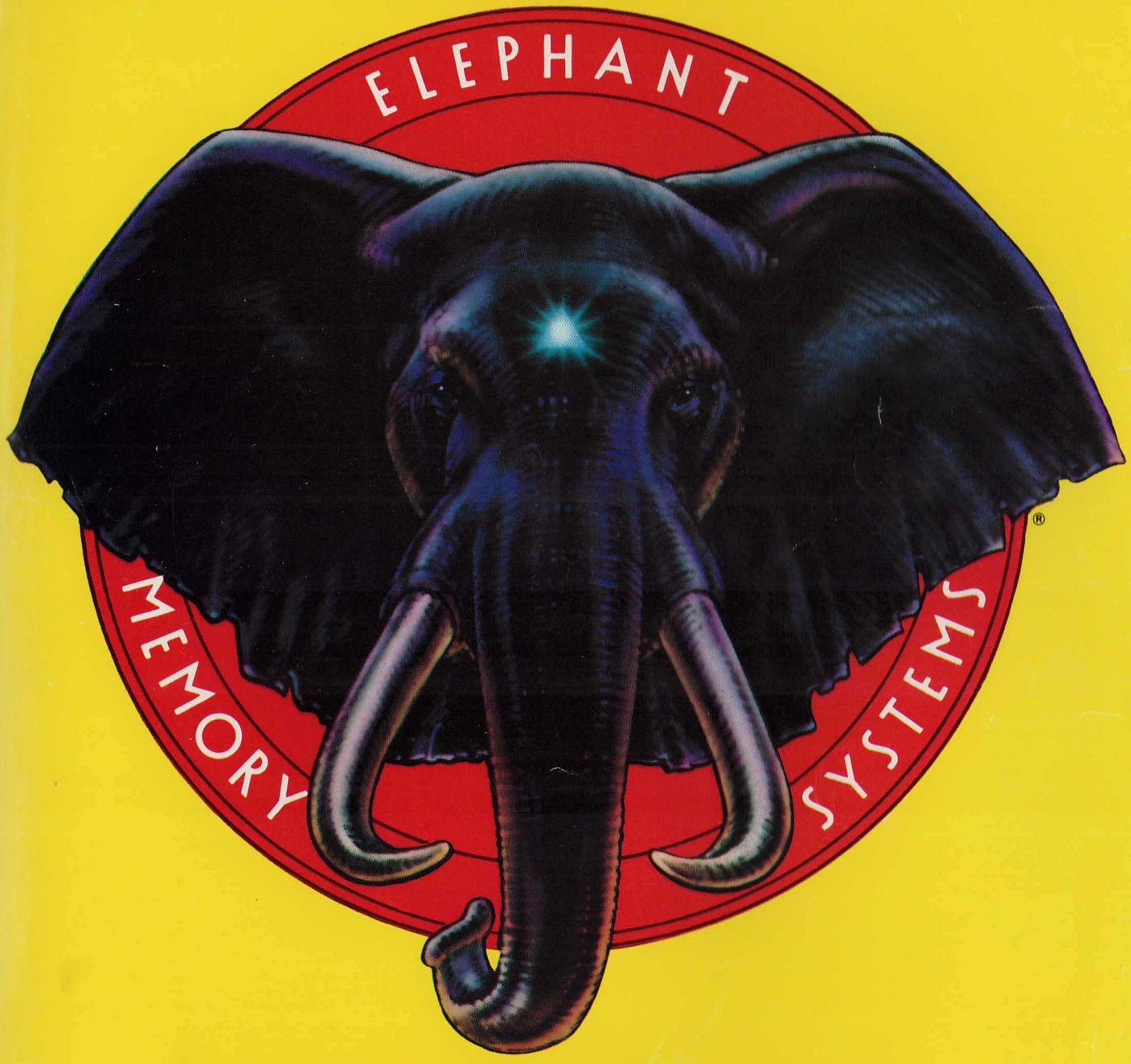

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